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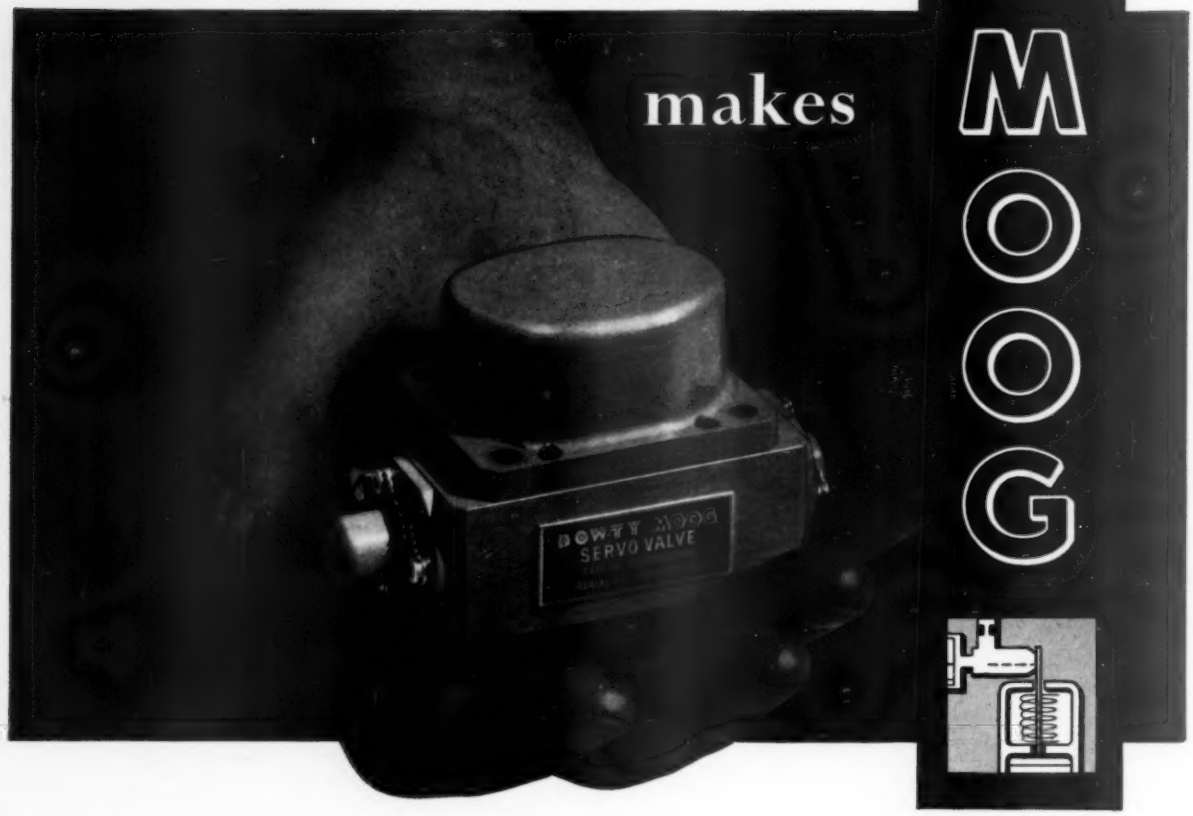

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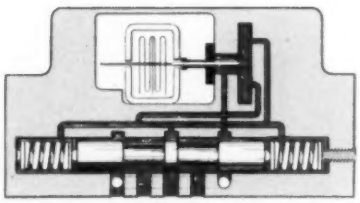

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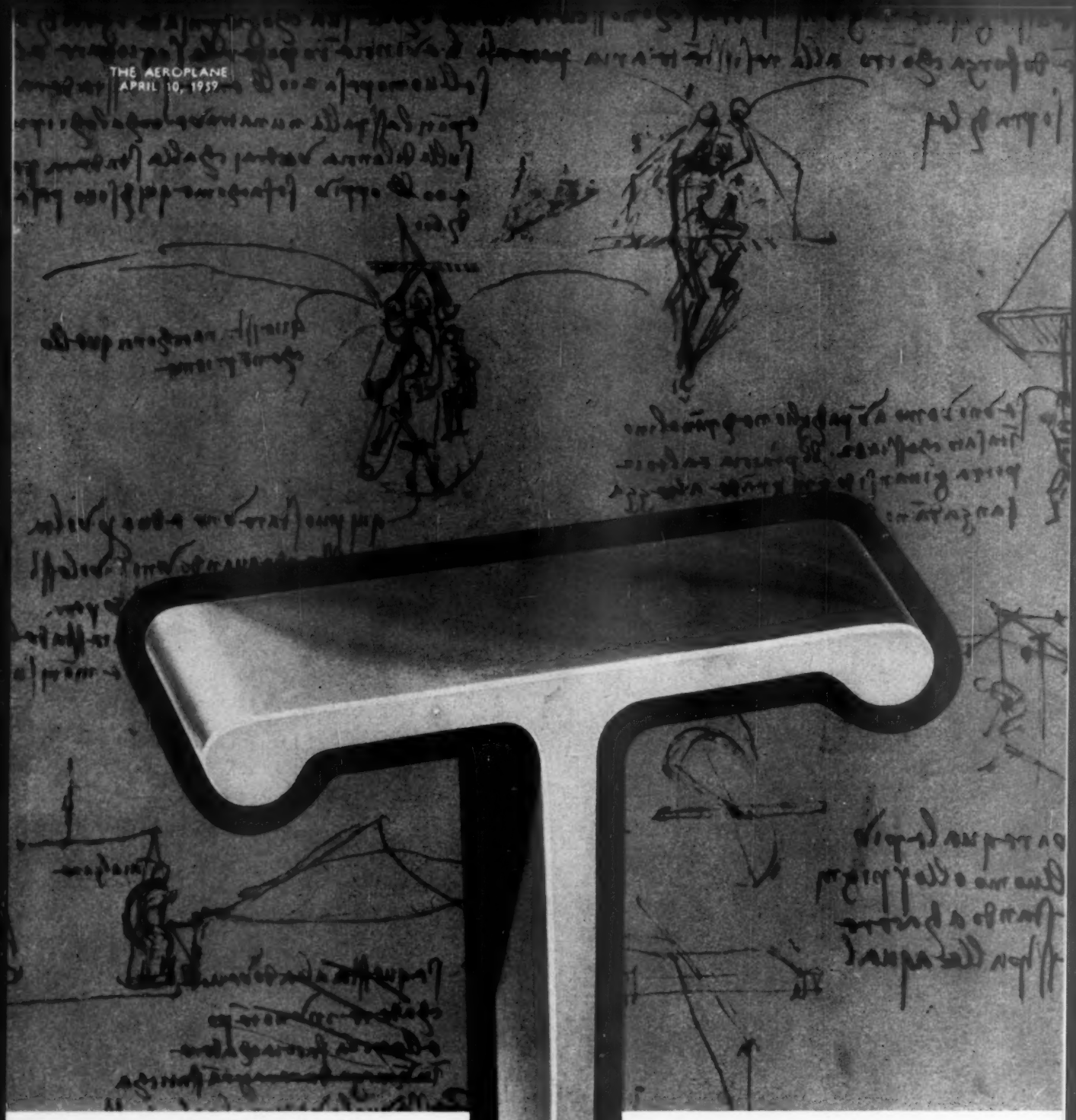

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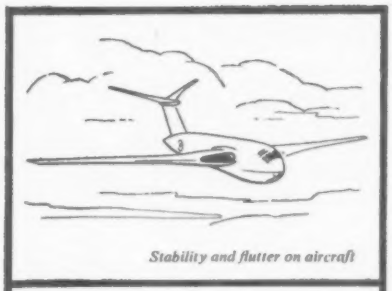

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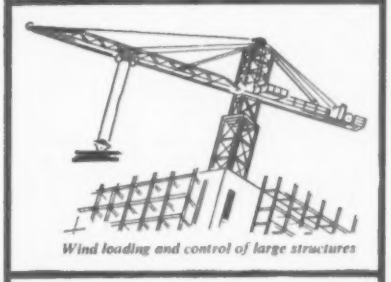
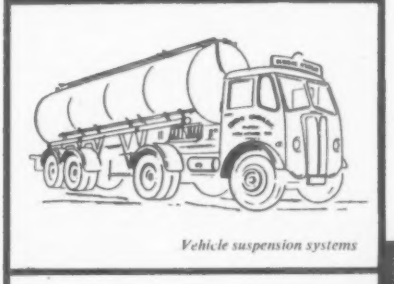


Wind loading and control of large structures



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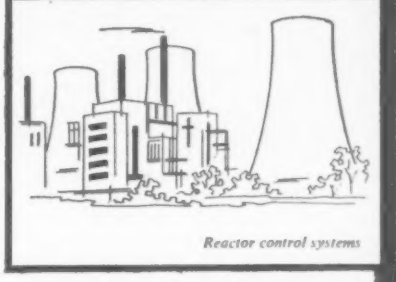

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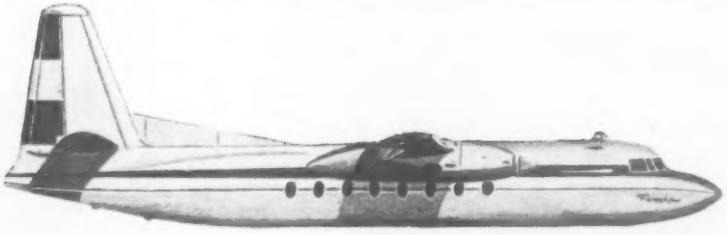

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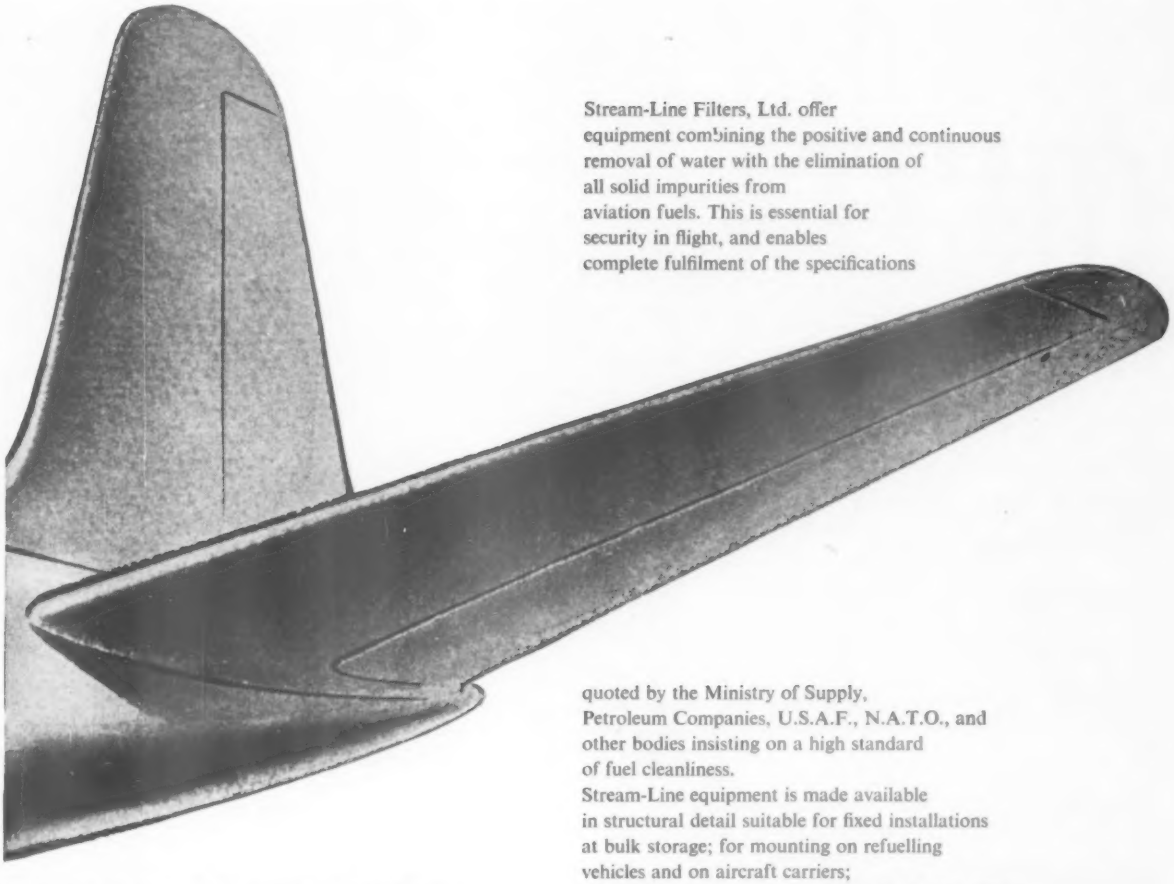

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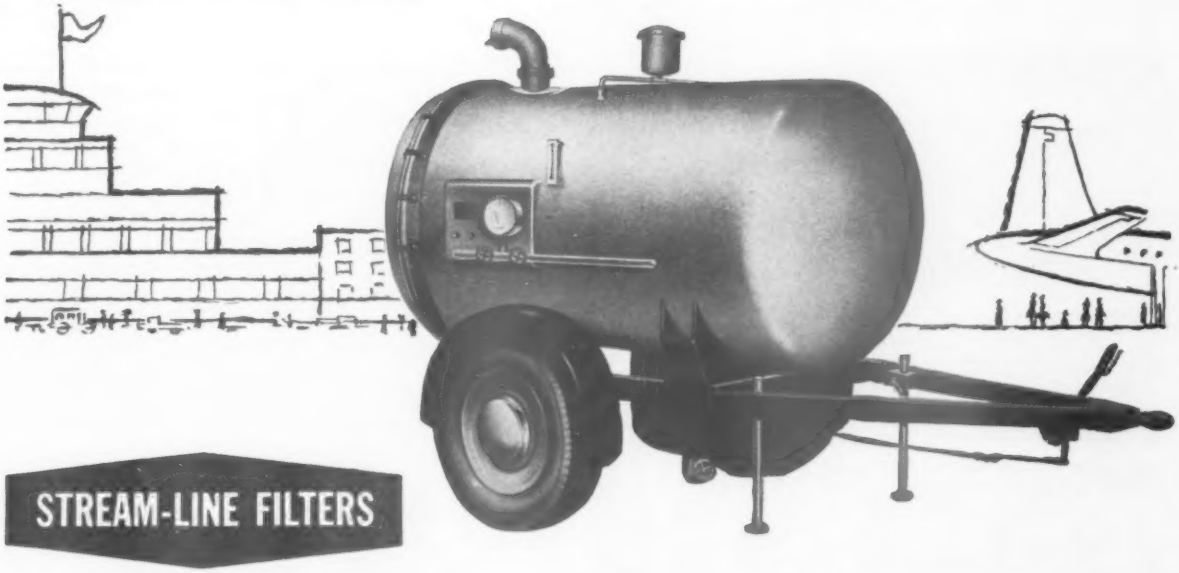

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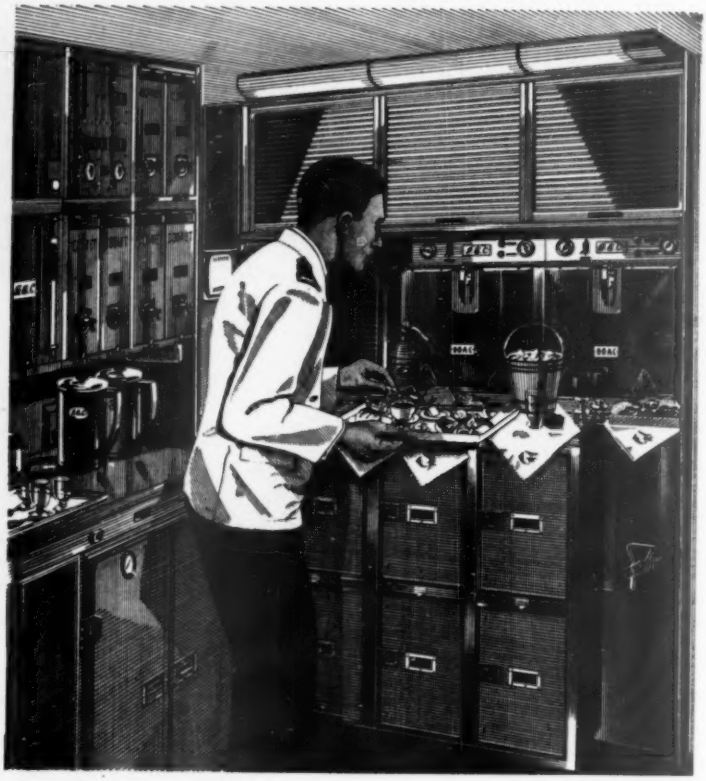

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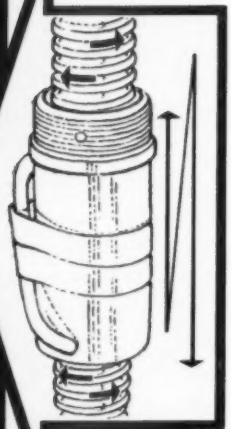

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AN AIRLINE FILIBUSTER

NO single airline operation could be better calculated to catch the public fancy than the inauguration of linked services able to girdle the Earth, if not in forty minutes, then at least in turbine-engined British aircraft belonging to B.O.A.C. But the first attempt to inaugurate such a service has ended inauspiciously. At the start all went well.

The first Comet 4 service to Tokyo by the eastward route left London Airport on the evening of April 1. Bad weather at Hong Kong made a diversion necessary but even after calling at Manila the Comet 4 arrived at Tokyo only five hours late on April 3. Meantime a Britannia 312 had left London Airport on March 31. This, too, encountered weather sufficiently bad to cause diversions. It duly reached Tokyo, about twelve hours late.

However, action by competing airline operators in the United States made it necessary on April 3 for Mr. Basil Smallpeice to make a public statement suspending further operation of the B.O.A.C. round-the-world service. As is generally known, American opposition is to the Britannia service linking San Francisco with Tokyo and has been voiced by Northwest Airlines.

The question is bound to be asked how did B.O.A.C. so underestimate U.S. opposition that the Corporation allowed itself to be manœuvred into a position where the maximum adverse publicity would surround the cancellation of a widely advertised service? The correct answer would appear to be that the Board of B.O.A.C. could not conceive that the United States Government would behave in any way calculated to upset the carefully scheduled plans of the British chosen instrument. B.O.A.C. was aware of the fact that since 1946 Pan American Airways have been flying between Hong Kong and San Francisco. The agreement which arranged for this carried the proviso that the British Government should have the right to designate which British airline should fly the reciprocal services. And in due course, the actual date is given as October 23 last, the British Government designated B.O.A.C. At this stage an American carrier, Northwest Airlines, which has ordered DC-8s to add to its fleet of DC-7s, operates services between New York and Washington to Seattle and thence to the Far East, put its spoke in the wheel. Our air attaché in Washington was advised of this on February 4 last.

There seems no reason to doubt that B.O.A.C., in view of the existing agreement mentioned above, could not envisage that the complaint tabled by Northwest would have to go through the whole procedure. But it has, and according to the latest information there seems little likelihood of the service being cleared before May 1. In such circumstances there can be no surprise if the eleventh-hour hold-up of B.O.A.C.'s permit to carry traffic over the Pacific sectors in the planned round-the-world network should be generally treated as an example of growing U.S. anxiety about competition from foreign carriers. Such anxiety has been shown several times during the past two years or more—notably in the case of Qantas' trans-U.S. service and of K.L.M.'s extension rights—but has been limited to loud complaints from various quarters. This time the complaints have produced direct results.

It is all very well to argue that the obtaining of rights over air routes is very much a matter of hard dealing and that no concession can be expected without a *quid pro quo*. There should be no question of negotiation in the circumstances. The British negotiators in the immediate post-war years did the right thing. They foresaw the day when British airline operators would have British aircraft available to extend a network around the World. It can only look like expecting too much on the part of the Americans to obtain at the pistol point further concessions for American trans-pacific services into Hong Kong. If this is what Northwest Airlines are trying to do, and who can doubt it, we should be foolish to expect them, in waging such a struggle, to pull any punches. Indeed, Mr. C. L. Stewart of Northwest Airlines said in Washington on April 1 that President Eisenhower should, if necessary, seek a review of the matter with Britain rather than permit U.S. interests to be flagrantly undermined.

In such an atmosphere it is only natural that our own M.T.C.A. should hit back equally vigorously. It was significant too that Mr. George Brown, the Labour "Shadow" Defence Minister, has spoken very forthrightly. Speaking at Belper, Derbyshire, on April 4, he is reported to have said: "This is just one more instance in a long line where American trade and commercial interests have been pursuing an aggressive, ruthless policy aimed at ousting Britain whatever the consequences."

These are hard words. But it will be fortunate if filibustering action to delay the coming into operation of properly negotiated agreements does not produce hard feelings too. And that is the last thing any of us want to happen between friends.

C

Matters of Moment

The R.A.F.'s Future

ONE OF the principal aeronautical events of last week, which received considerable attention in the Press, was the visit by Mr. Harold Macmillan to the R.A.F. College at Cranwell and the V-bomber base at Cottesmore. (Photographs are on pp. 428-9.) The occasion was important enough as an official visit by Her Majesty's Prime Minister to the Royal Air Force—and was all the more noteworthy for being the first visit of a British Premier to Cranwell; the real significance, however, is to be found in Mr. Macmillan's own words in reply to his welcome by the Chief of the Air Staff.

"The responsibilities which the R.A.F. has shouldered so well in the past," he said, "will not grow smaller in the future. On the contrary, they have never been greater in time of peace. These duties are widespread. The R.A.F. has a vital part to play in the deterrent against global war, in providing forces in case of limited war, in assisting in the cold war, in showing the flag throughout the World.

"In fulfilment of these rôles many military tasks are involved; the strategic deterrent, reconnaissance, air defence, patrolling, Army support, troop-carrying and freighting, and maritime work, to name only some. The Royal Air Force will therefore play as great a rôle in the future as in the past.

"Indeed, the flexibility that air power can provide is one of the great military lessons of this century—and one that has never been more necessary than at present: the rapid call for help from one part of the World to another; the need for swift readiness; the adaptability of aircraft from one rôle to another. This applies throughout all the tasks of the Air Force from the work of the V-bombers in their great contribution to the Western deterrent to the work of Pioneers in helping to preserve law and order in the Arabian Peninsula.

"Political and military requirements will change; weapons and techniques will change; but basic military principles do not change, by land or air or sea. For as far ahead as we can see the pilot and the navigator have their great future.

"The challenge of the missile does not mean that the flying machine is out-dated. On the contrary, there will always be a very wide range of jobs that only a manned aircraft can perform. Even if that age comes when man is destined to move about in outer space, I have no doubt that the R.A.F. will supply the manpower and airmen will become the spacemen."

The Prime Minister also had something to say about the R.A.F. becoming an all-regular Force. It was moving successfully towards this, he said.

"I am quite sure that we were right in principle to take this big step in all the Services. It was a risk—but it was one worth taking. For this is far the best way of maintaining quality. Moreover, with the complexities of modern equipment and the speed of reaction needed today it seemed more than ever necessary that the R.A.F. should be a regular force with people of continued long service and experience, who can be the backbone of the force. It is in turn our obligation to ensure that your equipment should always be the best."

A Cranfield Annual

DESPITE a general atmosphere of caution and a degree of shrinkage within the aircraft industry at the present time, the industry's principal post-graduate academic institution—the College of Aeronautics at Cranfield—shows no sign of being in the least disheartened by the effects of Defence White Papers and threats of economies. Indeed, those privileged to be present at the College's annual Senior Common Room dinner on April 3 found themselves, as always, in an atmosphere of tremendous enthusiasm for the tasks in hand.

In point of fact, expansion rather than recession seems to be the order of the day at Cranfield and the Principal, Prof. A. J. Murphy, was able to announce that the new accommodation wing at Lanchester Hall was at last in an advanced stage of construction. And there was talk later of the introduction of new courses and diversification of activity.

On this occasion, the eleventh of the series, SIR CHRISTOPHER HINTON, chairman, Central Electricity Generating Board and past member of the board of the Atomic Energy Authority, was guest of honour. He proposed the toast of the Senior Common Room, in a stimulating and thoughtful speech. Sir Christopher had something to say about the high proportion of net revenue spent by the aircraft and atomic energy industries on research and development. This, he said, was due to the fact that effort in both these cases was primarily directed towards defence, and he referred to the future problem of financing research and development for purely civil applications.

REVEALED DETECTION.—Hitherto, Firestreaks seen in public have had opaque windows or covers over their infra-red detection heads. At Cottesmore last week, during the Prime Minister's visit, the weapons on the Javelin had clear windows over the lock-on guidance and proximity-fuse detectors in the nose and body respectively.

Sir Christopher commented that defence expediture was to blame for the "too fast" expansion of technology. This expenditure, he said, drags after it a broad band of technological development at an uncomfortable pace. One effect of this was that engineers were driven to depend more on science than on engineering; there was a tendency to forget that science is only a foundation on which engineering is based.

The reply to Sir Christopher was made by PROF. A. J. KENNEDY, Professor of Materials and Metallurgy, who described in memorable style the current expansion of the College's work and certain proposed studies. He made reference to two newcomers to the Cranfield team and had something to say about those who had left since the previous dinner.

MR. J. R. PALMER, of the Department of Propulsion, proposed the toast of the guests. On their behalf MR. H. B. IRVING replied and expressed everyone's thoughts when he said that the guests at Cranfield always felt that they were among friends. He paid tribute to the past Principals of the College for the work they had done in building it up and he spoke warmly of the present Principal's efforts. Mr. Irving referred particularly to recent work done at Cranfield and mentioned especially the researches into noise suppression which were still going on at the College. In this context he thought that the Government might usefully spend some of its money on noise research.

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FAIREY DIRECTORS.—Left to right, C. H. Chichester Smith; R. L. Lickley; A. Vines; H. G. Gregory; L. R. E. Appleton; Dr. G. S. Hislop; Gp. Capt. R. G. Slade; and L. S. Dawkins.

Fairey Direction

AS we recorded in THE AEROPLANE on March 20, there has been some major reorganization of Fairey Aviation into a holding company, and two principal subsidiaries. The former is to be known as The Fairey Company Limited—while the two wholly owned subsidiaries are Fairey Aviation Ltd., responsible for all aircraft and allied manufacturing activities in the U.K.; and Fairey Engineering Ltd., based on the Stockport Aviation Co. and bringing together all the group's general engineering activities. Existing Fairey subsidiary companies will not be affected and will now have the same status relative to The Fairey Co. Ltd.

These moves are in the current fashion of rationalization after diversification, and following the initial announcement has come news of the constitution of the boards of the various components. In the case of the new holding company, this remains in its original form with Mr. G. W. Hall as chairman and managing director and Mr. R. Fairey as vice-chairman—the remaining members comprising Mr. C. H. Chichester Smith, Mr. R. L. Lickley, Mr. J. C. Macpherson and Mr. A. Vines.

Mr. Chichester Smith becomes chairman of the new Fairey Aviation Ltd., and Mr. R. L. Lickley has been appointed managing director. Other members of the board are Mr. J. C. Macpherson, Mr. A. Vines, Mr. L. R. E. Appleton, Mr. L. S. Dawkins, Dr. G. S. Hislop and Gp. Capt. R. G. Slade.

The Fairey Engineering board comprises: Mr. C. H. Chichester Smith (chairman); Mr. A. Vines; Mr. H. G. Gregory (general manager); Mr. L. R. E. Appleton; and Mr. L. S. Dawkins.

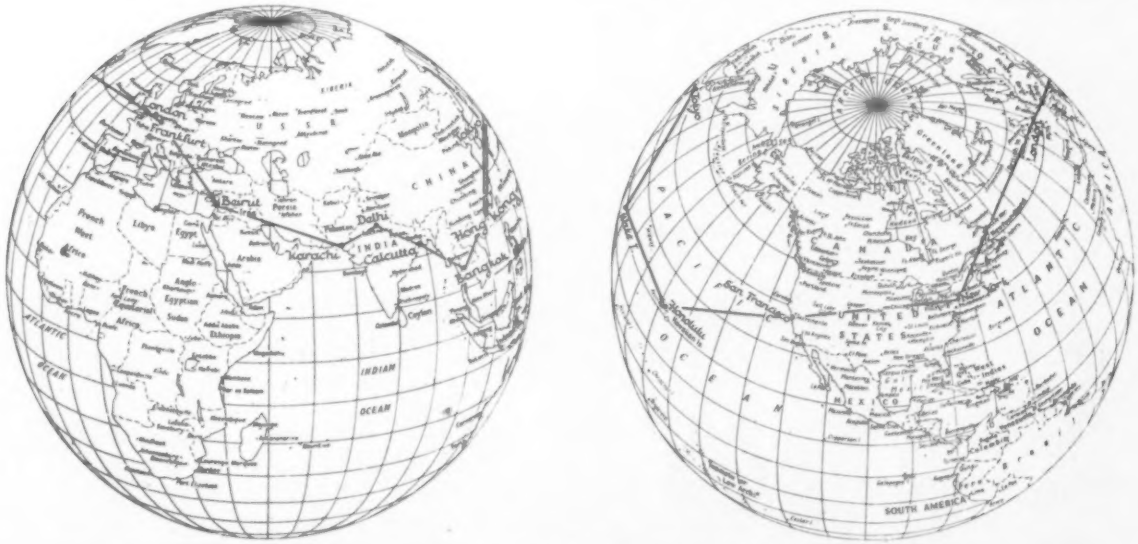
Mr. Chichester Smith, D.S.C., A.F.R.Ae.S., has been on the Fairey board for 16 years.

Mr. R. L. Lickley, B.Sc., D.I.C., M.I.Mech.E., F.R.Ae.S., was born in Dundee in 1912 and educated at the High School of Dundee, the University of Edinburgh and Imperial College. He joined Hawkers in 1933 and in 1946 went to the College of Aeronautics as Professor of Aircraft Design; he became deputy principal of the College in 1950 and joined Faireys in 1951 as chief engineer.

A Matter of Altitude

IT used to be fashionable to be "buzzed by a Yak" in the Berlin air corridors in the piston-engined era some 10 years ago, although, with the daily newspapers' characteristic disregard for niceties of fact, the Yaks invariably proved to be Lavochkin La-9s. Perhaps the appropriate abbreviation for the latter types may not have lent itself readily to Fleet Street usage.

There was no doubt, however, about the identity of the MiG fighters which displayed Soviet displeasure on Good Friday, at the passage between its French base and Templehof, Berlin, at 25,000 ft. of a Lockheed C-130 turboprop transport of



GLOBE ENCIRCLEMENT.—These maps show the route round the World planned by B.O.A.C. to be operated by Comet 4s and Britannias. (See page 424 and the Editorial.)

the U.S.A.F. Three MiGs made close passes on the C-130, staying in its vicinity from the East German border until Berlin, and stationing themselves on occasions within 10 ft. of the wing tips.

The reason given by the Russians for this lapse from 10 years of good manners in the Berlin corridors was not convincing. It is true that the C-130 was the first aircraft in the post-War period to fly above 10,000 ft. within the corridors, but there was no mention of a height limitation in the original four-Power agreement resulting in their establishment.

The height band between 2,500 and 10,000 ft. came to be accepted over the past 14 years because there had been no requirement for higher operating altitudes. With the introduction of turboprop transports this is no longer the case, but the "complications" mentioned by the Russians resulting from high-flying aircraft from the West in the corridors are apparently mainly concerned with the dangers of collision with Soviet and East German military machines. These have hitherto enjoyed unrestricted operation above 10,000 ft. in the 20-mile corridors, and the Russian view is that mixing Western and Soviet air traffic in these regions could lead to unintentional traffic hazards.

The Americans have not accepted the Russian arguments, but the exchange of protests ended on a more conciliatory note when the Soviet authorities suggested that a new agreement should be negotiated for flights to Berlin above 10,000 ft.

Iraq Withdrawal

ALTHOUGH the recent official announcement of Iraq's withdrawal from the Baghdad Pact merely confirmed a state of affairs which had been in effect since the revolution, it resulted in the severance of the last remaining links of the R.A.F. with that country. Since Gen. Kassem came to power last year the 320 Service personnel manning the staging post at Habbaniyah airfield have been virtually isolated, and no R.A.F. aircraft were allowed to use its facilities.

The rights to over-fly Iraq which the R.A.F. formerly enjoyed have now ended, and the R.A.F. training and maintenance contingent at the Habbaniyah staging post is being withdrawn. One of the Hunter 6s supplied to the Iraqi Air Force just before the revolution in July, 1958, and based at Habbaniyah, was instrumental in defeating the recent counter-revolution. One of its rocket projectiles exploded in a room at Mosul in which the rebel leaders were holding a conference.

GAPAN Presentations

AT the annual presentation of the awards of the Guild of Air Pilots and Air Navigators, held on board H.Q.S. "Wellington," Victoria Embankment, London, on April 2, Sir Frederick Tymms officiated.

The citations were: MR. BROOKE-SMITH: For his test flying in a progressive programme of research aircraft directed towards high-speed and vertical take-off and landing; B.O.A.C. COMET AND BRITANNIA FLIGHTS for their part in the introduction of scheduled passenger services with both turboprop and turbojet aircraft over the North Atlantic in 1958; TRANS AUSTRALIA AIRLINES for their excellent safety record during 12½ years of operation; BRIAN TRUBSHAW for meritorious service to British aviation as a test pilot over a number of years, including test flying of the Viscount and culminating in the prototype development flying of the Valiant; AIRCRAFT AND ARMAMENT EXPERIMENTAL ESTABLISHMENT: To the captains and navigational crews engaged on test evaluation flying of the Dectra navigational system.

A Franco-American Front

TOWARDS the end of last year (December 12) we reported the development in France of a supersonic bomber, the Mirage IV, to carry the French atomic bomb. The new aeroplane was then to make its first tests early in 1959 in South Algeria. The design, though nominally a continuation of the Mirage series of interceptors, was we gathered an entirely new design of delta-wing layout, initially to be powered by two afterburning Atar 9 turbojets. We pointed out then that a truly supersonic engine would later be required.

A report just to hand from Paris discloses that of the five engines originally considered, the Olympus was generally regarded as the favourite; it was thought in France that the Rolls-Royce project considered for the aeroplane, being only in plan form, could not be ready in time. The same report states that the Pratt & Whitney J75 had originally been turned down as not having sufficient thrust for its weight.

Now for reasons "sufficiently obscure" there has been a reconsideration of the position and the J75 is to be selected. Moreover it is considered suitable not only for the "European strategic bomber of 45 tonnes" but also for the Super-Caravelle. The total orders could amount to 800 engines.

Clearly, for such a project to be successful, these engines would have to be built in France. Among the organizations there with adequate resources to handle such a proposition is SNECMA, the nationalized engine company. There is evidence, it seems, that Pratt & Whitney repair work on J57 engines in Europe is to be done by SNECMA, and, when they come, the J75 engines as well.

The existence of the Common Market in Europe and the ever-closer integration of France, Germany and Italy in manufacturing matters has made the obtaining of interests in Continental aircraft firms of special importance. Various American organizations have been formed to do this.

The question is now being asked whether SNECMA will have to be denationalized before Pratt & Whitney can take an interest in it. Whatever the answer, it is clear that much more intense competition for the British aircraft industry can be expected.

Triumph at Twickenham

FOR the second year running the R.A.F. have won the Services Rugby Tournament. This was the outcome of the game at Twickenham on Saturday last (April 4) when the Army were beaten by 11 points to 3 after a hard but fairly even contest. The defeat of the Army by the R.A.F. followed on their victory over the Royal Navy earlier on, thus completing the double—a feat not achieved by them since 1923.

The R.A.F. well deserved the Championship win and played an enterprising and venturesome game inspired, no doubt, by their captain and scrum-half, D. O. Brace. Their forwards were excellent and their backs just that faster than their Army counterparts. Full-back Wright had a splendid game and a great 50-yard run by him and a pass from Brace to Burgess brought the first R.A.F. try after 35 minutes.

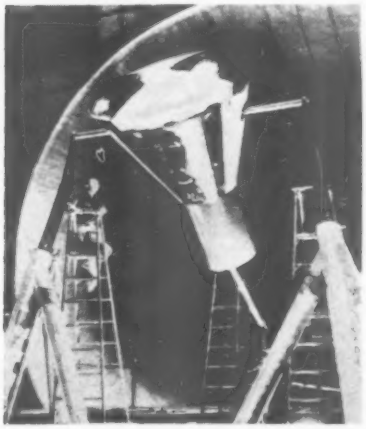
ROYAL AIR FORCE TEAM: Plt. Off. B. B. Wright (Debden), S.A.C. R. O. Rawson (Wattisham), S.A.C. D. W. Phelps (Innsworth), A.C. A. J. Rhodes (Wilmslow), A.C. W. Burgess (Hereford), Flg. Off. P. E. Mettler (High Wycombe), Flg. Off. D. O. Brace (St. Athan) (capt.), Flg. Off. J. M. Ross (Cosford), Flg. Off. E. J. Jones (Halton), Flg. Off. P. W. Watson (Benson), Cpl. R. G. Long (Innsworth), Flt. Lt. G. J. A. Head (Brampton), A.C. L. R. Evans (Bridgnorth), Flg. Off. F. J. S. Walton (Gaydon), A.C. P. E. McGovan (Cardington).

The DERRY and RICHARDS Memorial Medal
TOM BROOKE-SMITH Chief Test Pilot, Short Bros. & Harland Ltd.
The BRACKLEY Memorial Trophy
BOAC Flight Managers
Capt. R.E. MILLICHAP Comet
Capt. A.S.M. RENDALL Britannia 102
Capt. D. ANDERSON Britannia 312
The Master of G.A.P.A.N.
Sir FREDERICK TYMMS K.C.B.
The CUMBERBATCH Trophy
JOHN L. WATKINS T.H.A. Director of Engineering
The AWARD of MERIT
BRIAN TRUBSHAW Dep. Chief Test Pilot, Vickers Armstrongs (Aircraft) Ltd.
The JOHNSTON Memorial Medal
A. & A.E.E.
Sqn. Capt. H.A. "BRUIN" BURNS
Mfg. Cdr. A.H. "PETER" GIBB
and W. "DOC" STUART, Sqn. Ldr. D.F.H. CROCOTT, Sqn. Ldr. E.W. HARE, Sqn. Ldr. H.G. CLARK, Flt. Lt. H. TOPE and Flt. Lt. H. RUMBLE

General Aviation News

INTERNATIONAL ASSEMBLY.—The Shackleton sales week-end from April 24 to 26 promises to be an international gathering of remarkable variety. In addition to a large number of used aircraft, many new types will be visiting the U.K. for the first time during the Kidlington meeting. Participation is promised by Beech, Cessna and Piper, who are demonstrating some of their private and executive aircraft, while Continental manufacturers will be represented by the Jodel D.117, Rhein-Flugzeugbau RW.3, the Aeromere Falco, the Piaggio P.136 and P.166, and the Tipsy Nipper. British-built aircraft on display will include an Auster Workmaster, D.H. Dove, Druine Turbulent, Garland-Bianchi Linnet and Thruxton Jackaroo. The two Piaggios will be flown by Marchesa Carina Negroni and Commandante Aldo Gasperi and will be available for flying by prospective purchasers.

SAAB IN PARIS.—The Saab Aircraft Co. has announced that its Draken, Lansen and Safir designs will be flown at the Paris Aeronautical Salon (June 12-20).



MANNED CAPSULE.—A model of a satellite capsule is seen here positioned in a full-scale tunnel of NASA for lift, drag and static stability tests.

ALLISON-CONVAIR. — Work has begun on the first production conversion of a Convair 340 to have Allison 501-D13 turboprops and Aeroproducts 606 propellers. The aircraft, recently purchased by Allison from Hawaiian Airlines, will be converted by PacAero Engineering Corpn. to the exact configuration now being offered military and commercial operators, and will be used for certification trials. Price of conversions will be $490,000, less the re-sale value (if any) of engines and propellers from the original airframe.

DART-POWERED.—The first production Breguet 1050 Alizé three-seat anti-submarine carrier-borne aircraft, which has a 1,950-h.p. Rolls-Royce Dart turboprop, made its first flight recently at Biarritz Parme. The French naval air service has 75 aircraft of this type on order.

BASTAN-BEECHCRAFT.—The first Beechcraft PD.18S powered by two Turboméca Bastan turboprops has flown about 50 hr. on test and is now being used by the Compagnie Générale des Turbo Machines at Marignane. A similar aircraft is being built by the Beech company in the U.S.A. for C.A.A. approval and possible commercial production. A second prototype is under way by S.F.E.R.M.A. at Mérignac.

KAMAN CONTRACT.—The Kaman Aircraft Corpn. of Bloomfield Connecticut, has received a $14,000,000 contract from the U.S. Navy for further HU2K-1 all-weather utility helicopters, powered by the General Electric T58 engine. Roll-out and initial flight of the first HU2K-1 are pending.

Photograph copyright "The Aeroplane"

GUNNED LIGHTNING.—When the Prime Minister visited Cottesmore last week he was shown the third pre-production English Electric Lightning, which is the first aircraft of the series to incorporate the upper gun installation of two 30-mm. cannon. These are carried in addition to two D.H. Firestreak AAMs.

PRESIDENTIAL F-27.—A Fokker F-27 is to be purchased by the Philippine Government for the personal use of President Garcia.

BRITISH POWER.—D.H. Gnome turboprops have been selected for the Breguet 941 STOL military and civil transport aircraft, which is scheduled to fly before the end of next year.

PICTURE SHOW.—An exhibition of Mr. Charles E. Brown's photographs is being arranged at the Kronfeld Club, 74 Eccleston Square (basement), London, S.W.1, from today (April 10) until April 17 (excluding Saturday and Sunday). It will be open from 18.00 hrs. to 22.00 hrs. daily; the admission fee is 1s.

XV-3 DEVELOPMENT.—The Bell Helicopter Corpn., Forth Worth, Texas, has been given an extension to its contract for development of the U.S. Army-sponsored XV-3 tilting-rotor fixed-wing VTOL aircraft to cover additional flight testing by the company and the U.S.A.F. The XV-3 made a full conversion flight on December 18 last, and earlier this year flew for 2½ hr. making three conversions.

INVERSION.—A record of 2 hr. inverted flight is claimed by Jean Falloux, of the French Air Force. Previously another Frenchman had remained upside-down for 1 hr. 15 min.

Next Week

THE issue of THE AEROPLANE dated April 17 will be a specially enlarged number devoted to the increasingly important subjects of "Missiles and Astronautics."

Containing specially commissioned articles dealing with all aspects of these subjects, and an illustrated catalogue of the World's missiles, this issue will cost the usual 1s. 6d. from bookstalls and booksellers, or 1s. 10d. from the publishers, Temple Press Limited, Bowling Green Lane, London, E.C.1.

ANGLO-AMERICAN.—This picture of the Canadair-Convair 540 (Napier Eland engines) was taken near White Plains, New York, during the current sales and demonstration tour.

DROVER FOR BRITAIN.—A D.H.A. Drover has been acquired by the Air Navigation and Trading Co., Ltd., of Squires Gate, Blackpool, and is shortly to be ferried over from Australia. This aircraft, VH-BMU, will be re-registered G-APPP.

FRENCH SAILPLANES.—Production of 100 Breguet 905 Fauvette (Warbler) single-seat standard-class sailplanes has begun. The first is to be delivered to Cdr. Tony Goodhart. A two-seat version of the Fauvette, the Br.906 Choucas (Jackdaw) is scheduled to appear early next month.

Commercial Aviation Affairs

SWISS SURVEY.—A Dornier Do 27 has been bought by Swissair Photo A.G., a subsidiary of Swissair, for air-survey work.

COMET NEWS.—The first non-stop flight from London to New York by a B.O.A.C. Comet 4 was made on March 24, when G-APDH commanded by Capt. R. C. Alabaster made the flight in 7 hr. 45 min. On March 28 a B.O.A.C. Comet 4 set a new record of 7 hr. 29 min. for the London-Montreal flight. On March 31, a Comet 4 of Aerolineas Argentinas flew from Santiago to Buenos Aires in 1 hr. 17½ min., beating George Errington's 1957 record in a Vampire Trainer.

FIRST CLASS BY B.E.A.—On international routes this summer, B.E.A. will increase first-class accommodation in its Viscounts by 60%. First-class seats will be available on 40 flights a day, to and from Paris, Nice, Copenhagen, Oslo, Stockholm, Zürich, Geneva and Frankfurt. The first-class compartments at the rear of B.E.A.'s Viscount 806s now accommodate 16 passengers (instead of 12), in B.E.A.-developed double armchair units.

SURCHARGE APPROVED. — The C.A.B. has approved for one year the increase in transatlantic fares and the jet surcharge agreed by IATA, but has reminded the airlines that they will be expected to cut prices if jet transports reduce their costs. A jet surcharge of $10 between New York and Trinidad and New York and Caracas; and of $20 between New York and Rio de Janeiro and New York and Buenos Aires has also been approved.

C.P.A. DOMESTIC BRITANNIAS.—Canadian Pacific is to use Britannias on its transcontinental route between Vancouver and Montreal via Winnipeg and Toronto, which starts on May 4 on a daily basis. The aircraft will be equipped for 58 first-class and 51 tourist passengers.

A PRIVATE VISCOUNT.—Mr. and Mrs. Herbert May have become the first private owners of a Vickers Viscount with the purchase of a V.786 from Lanica, the Nicaraguan airline. It is being converted from 44 to 14 seats and a full executive interior is to be installed later. It will be used on journeys between the May estates in Washington and Pittsburg and for other business and pleasure travelling.

BRITANNIA DELIVERED. — The second Britannia 307 for Air Charter was delivered to Southend on March 24. Originally built for Northeast Airlines, it has recently been on charter to El Al.

CAMBRIAN RESUME. — Cambrian Airways reopened their Cardiff-Bristol-Southampton-Paris service on March 23, after its winter lapse. Dakotas have been leased from B.E.A. to operate this service.

CARAVELLE DELIVERY. — On March 19 the first production Caravelle was handed over at Toulouse to an Air France crew, who flew it to Orly. This delivery was ahead of contract and is the first of seventeen Caravelles to be delivered this year. A production rate of four a month will be reached in 1960.

EXCHANGE NEWS. — Aircraft Exchange, Inc., is developing a "futures" market, in which airlines will submit current quotations for future deliveries. Such a market should materially help buyers, sellers and financiers to plan future programmes. Among the types recently offered through the Exchange are Vikings (lots of four and three, at prices ranging from $28,000 to $70,000 each), and a Bristol 170 Mk. 21 at $85,000. One contract involving four C-47s has recently been finalized through the Exchange.

SECOND 880 FLIES.—First flight of the second Convair 880 was made at San Diego on March 31—nine weeks after the first 880 flew. The latter has now accumulated 54 hours in 27 flights, and has returned to San Diego from Edwards Air Force Base.

COCKPIT CHECK.—Mr. E. R. Queseda, Federal F.A.A. Administrator, has written to all U.S. airline presidents asking them to stop forthwith the practice of captains leaving the cockpit to talk to passengers during flight.

REDIFON 880 SIMULATOR. — Swissair have ordered from Redifon, Ltd., of Crawley, an electronic flight simulator for the Convair 880. It will be used by both Swissair and S.A.S. crews at an average utilization of 3,000 hr. a year.

NEARLY READY.—London's new heliport, built at Battersea by Westland Aircraft, Ltd., is almost completed. It is to be opened on April 23 and become operational the next day.

Military Aviation Affairs

INDONESIAN EXPANSION. — According to recent reports the Indonesian Air Force is negotiating for the purchase of 40 transport aircraft and helicopters in the U.S. The Indonesians are seeking to acquire a squadron of Lockheed C-130 Hercules and a squadron of Vertol helicopters if approval is forthcoming from the U.S. State Department. The Indonesian Air Force is already using Russian operational equipment, and is to receive 18 Gannets from Britain starting later this year. Training for the latter aircraft has already begun.

OVERSEAS TOUR.—The Secretary of State for Air, the Rt. Hon. George Ward, is undertaking a short overseas tour to visit staging posts in Africa and R.A.F. units in Kenya and Cyprus. He will also spend a short time in Rhodesia where he will see the R.R.A.F. Mr. Ward left the U.K. in a Transport Command Comet on April 2 and is due to return on April 12.

DOVES ABROAD.—The second D.H. Dove for the Irish Air Corps left Chester on March 24 for Dublin. This aircraft, a Mk. 5 with accommodation for eight passengers and a crew of two, will be used for radio calibration, photographic and communication duties. Doves have now been exported to 44 countries.

U.S. EXPORT.—Ten Albatross amphibians have been ordered by the R.C.A.F. from the Grumman Aircraft Co. at a cost of $6 million.

SWISS DRAKENS.—A 16-man Swiss Air Force delegation headed by Col. O. Keller has recently visited the Saab Aircraft Co. at Linkoping, Sweden, to make further tests with the Draken supersonic fighter and to discuss manufacturing processes. The type may eventually be built in Switzerland.

FOR SEARCH AND RESCUE.—The U.S. Coast Guard is about to take delivery of six Sikorsky S-58 helicopters equipped for instrument flying. The Service has at present 127 aircraft, 75% of which are fixed-wing types. During the next few years the fleet will have equal numbers of helicopters and fixed-wing aircraft; a recommendation has been made that the total aircraft be increased to 195, 99 of which would be helicopters.

THE R. DANISH A.F.—A proposal for a new defence law has been put before the Danish Parliament for the R. Danish A.F. to be gradually decreased to five or six squadrons as guided missiles are introduced. There are at present eight first-line squadrons: five of F-84 Thunderjets, one of Hunters and two of F-86D Sabres. F-100 Super Sabres are expected this year, and interest has been shown in the Northrop N-156F.

PAKISTAN B-57s.—The U.S. Embassy in Karachi stated last week that the Pakistan Air Force will shortly receive its first Martin B-57s; the number being supplied has not been revealed. The Indian Air Force operates Canberra PR.7s and B.8s.

MORE THUNDERCHIEFS. — A U.S.A.F. contract, valued at $16,410,000, for advanced versions of the F-105 Thunderchief has been given to the Republic Aviation Corpn. The company is now producing the F-105B single-seat fighter-bomber; the follow-on orders are for the F-105D single-seat and the F-105E two-seat all-weather types.

MISSILES FOR ITALY.—Agreement was recently reached for the supply from the U.S. of Jupiter IRBMs and their nuclear warheads to the Italian forces. These are already operating with Honest John tactical missiles. The nuclear warheads of the Jupiters will, apparently, remain under American control, although the missile bases in Northern Italy will be entirely manned by Italian personnel, who will undergo training in both the U.S. and Italy. Jupiters will probably be supplied to Turkey and other nations within NATO.

HUNTER ORDER COMPLETED.—On March 25 the last of a series of some 450 Hawker Hunters which were built under licence in Holland and Belgium was officially handed over by Fokker to the R.Neth.A.F. The delivery marks the end of the largest military production contract that Fokker has ever undertaken, in co-operation with the Netherlands and Belgian industry.

News About People

LECTURES POSTPONED.—The 1959 Brancker Memorial Lecture, scheduled to have been given by Capt. E. V. Rickenbacker, chairman of Eastern Air Lines, on April 13, has been postponed until September 14. It will be given at the Royal Institute of British Architects, 66 Portland Place, London, W.1, at 17.45 hrs., and be on "World Peace Through Air Transportation." Capt. Rickenbacker's lecture which was to have been given to the Bristol Branch of the R.Ae.S. on April 14 has also been postpored until September.

LORD BRABAZON HONOURED.—To celebrate the 50th anniversary of the first officially recognized aeroplane flight by a British subject in Britain, Lord Brabazon, who flew a Voisin biplane at Leysdown on May 2, 1909, is to be the guest of honour at a R.Ae.C. dinner on April 30. Lord and Lady Brabazon will attend a reception at Londonderry House the previous day, and he is to receive a silver model of the aircraft in which he made his historic flight.

DERBY LECTURE.—Mr. A. M. A. Majendie will lecture to the Derby Branch of the R.Ae.S. on "The Development of Instrument Flight Control of Transport Aircraft" at Hucknall at 17.30 hrs. on April 16.

"JO" WATERS.—Commander G. O. Waters, O.B.E., former chairman and managing director of Air Terminals, Ltd., died on March 3 in London. He relinquished the post with Air Terminals in April last year after a prolonged period of ill-health. A short appreciation appeared in THE AEROPLANE for May 9, 1958.

ALUMINIUM DIRECTOR.—Mr. E. L. Ashley (right), manager of the Banbury works of the Northern Aluminium Co., Ltd., for more than 25 years, has been appointed to the board. Mr. Kenneth Hall has resigned.

CANADAIR APPOINTMENTS. — Mr. Albert W. Yates (below, left) has been appointed manager of military transport sales of Canadair, Ltd., Montreal. He was formerly with the Fairchild Engine Division as manager of the service department. Mr. David W. H. Godfrey, A.F.R.Ae.S., M.I.A.S. (below, right) who recently concluded

five years on the staff of THE AEROPLANE has joined Canadair's public relations division as assistant manager of information services.

AGARD LECTURES.—Two joint R.Ae.S./University of London lectures are to be given by Prof. J. W. Miles, of the Department of Engineering, University of California, under the sponsorship of AGARD. The first—"Supersonic Panel Flutter"—is to be at 18.00 hrs. on April 17 at Imperial College, Roderick Hill Building (Aeronautics Department, Room 266), Prince Consort Road, London, S.W.7. The second will take place on April 24 at Queen Mary College, Mile End Road, London, E.1, when the subject will be, "The Generation of Surface Waves by Shear Flows."

P. W. LITCHFIELD.—The death is announced of Mr. Paul W. Litchfield, honorary chairman of the Goodyear Organization. He was 83.

R.Ae.C. OCCASION.—After the annual general meeting of the R.Ae.C. on March 25, Lord Brabazon, the president, presented trophies. The upper picture shows, left to right, M. René Dorand (Louis Bréguet Trophy); Sgt. Andy Gough (Bronze Medal), and Mrs. Ann Welch (Silver Medal). In the absence of Mr. John Cunningham and Mr. Peter Bugge the Britannia Challenge Trophy was accepted on their behalf by Mr. Pat Fillingham. Lord Brabazon received from the chairman, Col. F. Gough, a Gold Medal in recognition of his 50 years' connection with aviation. Col. R. L. Preston, the retiring secretary-general, was presented with a portrait of himself which is to be hung in the Club. In the lower picture, Mr. Dick Blackburn and Mr. Steve Twyman each received a clock in recognition of their 25 years' service with the Club.

Air Transport

The Pacific Hold-up

THE operation of a round-the-World network using an exclusively turbine-powered aircraft fleet makes a dramatic appeal, but the important features of the new services started (prematurely in the case of the Britannia) by B.O.A.C. last week were the introduction of Comet 4s on the Far East route and the extension of the London-New York-San Francisco route over the Pacific to Tokyo and Hong Kong.

When B.O.A.C.'s Pacific traffic permit is eventually obtained from the C.A.B., passengers will be able to fly by a British airline in a turboprop transport to the Far East by the more climatically comfortable westward route, and once again, after five years, they can now fly to the Middle East, India and the Far East by turbojet transport.

As already recorded (THE AEROPLANE, March 13, p. 317) Northwest Airlines lodged objections to the approval of traffic rights for B.O.A.C. between San Francisco and Tokyo and the Civil Aeronautics Board re-hearings began on April 1—when the first scheduled service Britannia was already en route after leaving London on the night of March 31. The situation is discussed in this week's leading article.

B.O.A.C.'s Britannia 312 Pacific services are to be flown via Honolulu and Wake Island to Tokyo and Hong Kong and crews are based at Honolulu for the San Francisco-Tokyo sectors and in Japan for the Toyko-Hong Kong sector. There will be two services weekly between London and Tokyo/Hong Kong by the westward route.

The first Comet 4 service to Tokyo by the eastward route left London Airport on the evening of April 1. It was on or ahead of schedule until the penultimate sector, when a diversion had to be made to Manila, Philippines, because of bad weather at Hong Kong. After flying to Hong Kong and thence on to Tokyo the Comet was about five hours late. The Britannia 312, on the initial westbound flight, was diverted to Boston because of fog in the New York area and was delayed by minor trouble at San Francisco and Honolulu and by headwinds; it arrived 12 hours late.

An announcement of the postponement of B.O.A.C.'s Pacific service was made by the managing director of the Corporation, Mr. Basil Smallpiece, on April 3 in Tokyo.

At the hearing on April 1 Northwest's representatives contended that the approval of Pacific rights for B.O.A.C. would cost the U.S.A. carriers about $13 million in revenue and asked the C.A.B. to refuse (or remove) Tokyo as an approved traffic point on the Corporation's service. It was pointed out that B.O.A.C. had repeatedly refused to allow traffic rights at Hong Kong for Northwest in spite of authorization for such rights by the U.S. Government.

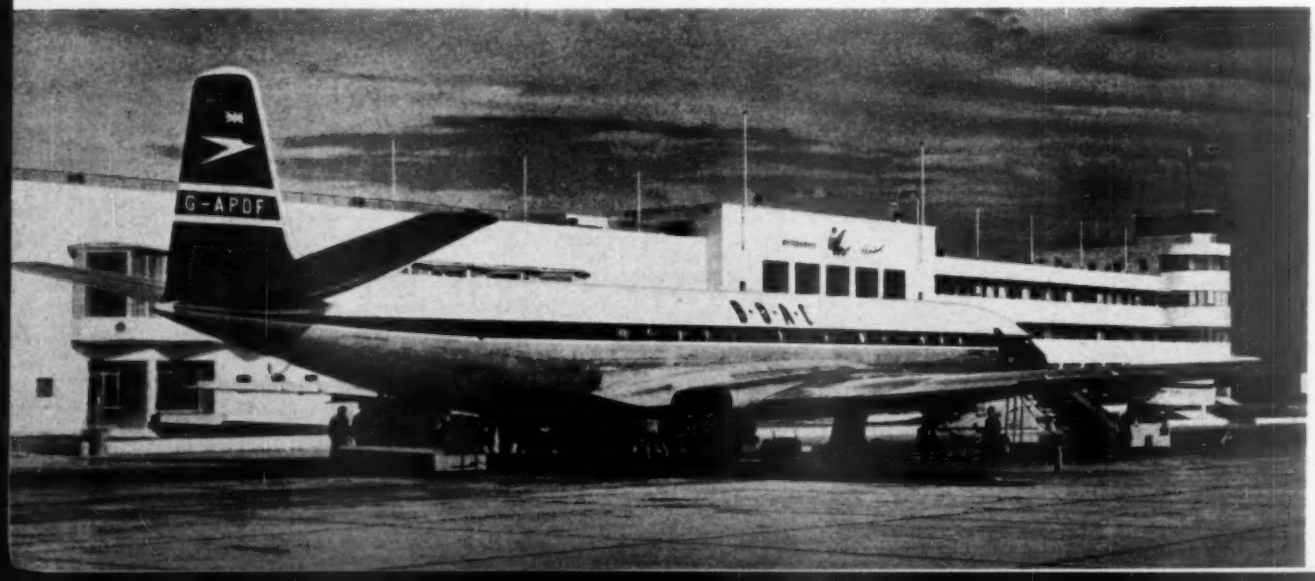
The C.A.B. examiner at the hearing has ordered that B.O.A.C. and Northwest should submit final briefs by April 11. His recommendations to the Board will probably be made public a few days afterwards, but it is unlikely that the C.A.B. decision in the case will be available before May.

On the night of April 3 the Ministry of Transport and Civil Aviation issued a statement which explained something of the background to the hold-up of B.O.A.C.'s Pacific plans. This said:—

> Under the air services agreement of 1946 between the U.K. and the U.S., as amended, the U.S. has granted the U.K. the right to designate an airline to operate on the route proposed by B.O.A.C. for their new round-the-world service through the U.S. to Tokyo and Hong Kong. B.O.A.C. were accordingly designated more than five months ago, on October 23, 1958, and at the same time the corporation applied to the Civil Aeronautics Board for the foreign air carrier's permit, which under U.S. law the airline must obtain before operating the route granted in the air services agreement. . . .
>
> This permit has still not been issued, although the agreement provides that it must be granted "without undue delay." It had been understood that the permit would be issued shortly after the hearing held before the C.A.B. on November 19, 1958, but on February 4 the Board informed the British Civil Air Attaché in Washington that they felt bound to reopen the question in view of an intervention by Northwest Airlines. . . .
>
> The main reason for the delay in granting B.O.A.C.'s permit has been the opposition of Northwest Airlines. Northwest Airlines have sought to show that the air services agreement does not allow B.O.A.C. to carry traffic between Tokyo and the U.S. and, although the U.S. authorities have stated that this contention is incorrect and that B.O.A.C. does have these rights under the agreement, Northwest Airlines have nevertheless succeeded in delaying the grant of the permit.
>
> Northwest Airlines have stated that they would withdraw their opposition to the B.O.A.C. application if they were immediately granted landing rights at Hong Kong. Such tactics are completely unacceptable and amount to an attempt by Northwest Airlines to use the procedures of the C.A.B. as a means of bringing pressure on the U.K. either to concede valuable traffic rights under duress or to forgo the exercise of rights already granted by the U.S. Government.
>
> The U.S. authorities have, however, been informed that if the question of B.O.A.C.'s permit can be promptly and satisfactorily settled, Her Majesty's Government would be prepared to discuss any proposals put forward for allowing landing rights at Hong Kong to Northwest Airlines. . . .

Other paragraphs in the statement pointed out that the U.K. does not require procedures comparable with those of the C.A.B.; enlarged on the efforts made by the British Government during February and March; and "viewed with concern the fact that C.A.B. procedures can have the effect of frustrating the proper operation of the air services agreement."

RETURN OF THE COMET.—Last week saw the reintroduction of B.O.A.C.'s Comet services to and from the Far East. A Comet 4 is seen here on the apron at Mehrabad Airport, Teheran, where traffic stops are made on two of the four weekly services to Hong Kong and Tokyo.



It's proof like this that sells me the VISCOUNT

Capital Airlines figures emphasise original economy claims of the Viscount 700

These figures are taken from a study of operating costs recently made by Capital Airlines. The original estimates made in May, 1954, are compared with actual costs experienced in service.

Cost per aircraft-hour flown	*Original Estimate*	*Actual 6-months period ended 30th June, 1958*
DIRECT EXPENSE		
Pilots' salaries, travel; engine fuels; hull insurance; etc.	$ 96.15	$ 95.85
Direct maintenance labour, materials	57.76	47.12
Aircraft depreciation	45.91	46.36
Total direct expenses	199.82	189.33
INDIRECT EXPENSES		
Assigned expenses (of all other elements of operating expense allocated to types of aircraft on a formula basis)	$169.52	$169.20
Total operating expense	369.35	358.53
Costs per revenue aircraft-mile flown		
DIRECT EXPENSE		
Pilot's etc.	$ 0.402	$ 0.383
Direct maintenance	0.242	0.188
Aircraft depreciation	0.192	0.185
Total direct expense	0.836	0.756
INDIRECT EXPENSE		
Assigned expense	$ 0.709	$ 0.697
Total operating expense	1.545	1.453

It's experience—backed by figures like these—that is built into the Viscount 810/840

VICKERS VISCOUNT 810/840

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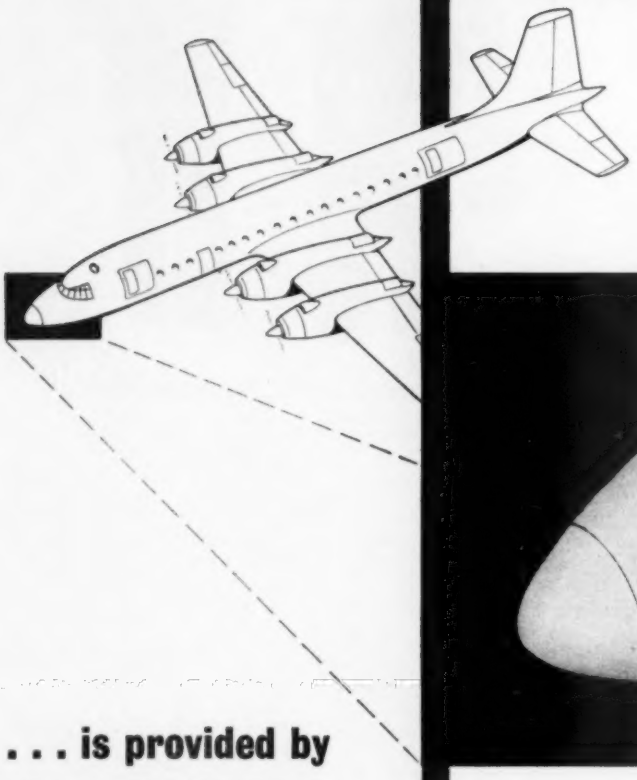

. . . is provided by the BLACKBURN Airborne Auxiliary Power Unit

AUXILIARY POWER UNIT. The Blackburn Artouste 510 auxiliary power unit provides compressed air for low-pressure-air starting of the main engines and for cabin conditioning, electrical power for ground servicing, and hydraulic power for operating the cargo doors.
The aircraft requirements are 2·1 lb./sec. air at 3·32 pressure ratio plus 16 s.h.p. during engine starting; 2·164 lb./sec. air at 3·32 pressure ratio for air-conditioning; and 25 s.h.p. for electrical power.

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E133/a

Demonstrating the Dart Herald

Photograph copyright "The Aeroplane"

A LENGTHY series of overseas demonstration flights by the Handley Page Dart Herald began on April 2 when the aircraft crossed the Channel to Le Touquet for the day. This was followed by a visit to Rome next day, and to Dublin on April 6. Today, April 10, the aircraft was scheduled to leave on its first major overseas sales tour, which will take it to India, Ceylon, Pakistan, Persia, Turkey and Greece before returning to England on May 19.

Visits to the Paris Aero Show are scheduled for the first and second week-ends of that event, and about the same time the Dart Herald will be participating in the company's own Fiftieth Anniversary celebrations (on June 17). Thereafter, sales tours to South America and to Australia and New Zealand are being planned.

The trip to Le Touquet was by way of being an "hors d'œuvre" for the British Press and, as it was the first time the Dart Herald had carried a full load of passengers under demonstration conditions and the first time it had been abroad, this and the visits to Rome and Dublin were also useful preliminaries to the tour which has now begun. The aircraft involved is the second (and at the moment, only) Dart Herald, converted from the second Leonides-Major airframe. The loss of the first Dart Herald last September naturally delayed the company's plans to introduce the type, but the wise decision has been made to press on with these all-important demonstrations rather than tie the aircraft up in completing the C. of A. trials.

By August, a new Dart Herald should be in the air, and this will then take over the task of demonstration while the second prototype completes the work for the full C. of A., which will include tropical trials. Certification is scheduled to be complete by the spring of 1960. Manufacture of components for up to 25 Dart Heralds is proceeding at Woodley, so that delivery can be offered by the middle of 1960 if orders are placed now.

A pilot's assessment of the Dart Herald appeared in THE AEROPLANE for March 27 (pp. 380-382) and it is only necessary to add here that from the passenger's point of view the aircraft adequately meets the standards which would be expected of a modern short-stage airliner. The width of the fuselage makes four-abreast seating more than usually comfortable in an aircraft of this size. Up to 47 seats can be installed; at present there are 38 seats, a toilet at the rear and a galley forward. Temporary provision has also been made for a navigator at the front of the cabin, where the duplicate compass, A.S.I. altimeter and clock, in any case, add interest on demonstration flights.

One way and another, Handley Page have had less than a fair share of luck with the Herald project to date. It is to be hoped that the energetic efforts now being made will succeed in selling what was, in fact, the first modern British airliner built completely as a private venture. Between £3 million and £4 million has been spent on its development. The market, although large, is a competitive one; but the Dart Herald is, the company claims, £50,000 cheaper to buy than its principal competitor.

There are also interesting possibilities so far as future development is concerned. These cannot be discussed in detail, but it can be said that the gross weight can be expected to grow quickly from the present 37,000 lb. to about 38,500 lb., with further increases to follow. Using the Dart R.Da.10 with a suitably strengthened structure, weights up to 44,000 lb. could be permissible and the aircraft's gross may eventually approach 50,000 lb.

With its present cross section, the fuselage could be stretched by as much as 20 ft., making an aeroplane capable of carrying about 65 passengers—or, if a hinged nose was introduced, three cars. While these and other possibilities are being studied in the project office, an extensive programme of structural and fatigue testing is in progress, to establish a 40,000-hr. life for the airframe.

B.E.A. Prospects Brighter

DURING February, British European Airways carried 13% more traffic than in February, 1958—despite widespread disruption of services by fog. A total of 460 services were cancelled through bad weather, making a grand total of 1,800 in four months. Even so, and despite the general recession in traffic earlier last year, B.E.A. hope to have made a small profit in the 1958-1959 financial year which ended on March 31.

Traffic results for February are tabulated below, and show that the increase in load ton-miles sold exceeded the increase in capacity ton-miles offered for the first time in a number of months. Over the past year as a whole, B.E.A. offered 16% more capacity than in the year before—an increase which is now known to have been excessive. In 1959, only slightly more capacity will be offered than in 1958, so that if the present trend of traffic expansion continues, load factors should begin to rise again.

B.E.A. now carries four million ton-miles of mail a year—a 100% increase in seven years. Revenue amounts to over £1,700,000 of which over £1,000,000 a year is attributable to routes out of the U.K.

TRAFFIC RESULTS—FEBRUARY, 1959

	February, 1959	February, 1958	Variation
Capacity Ton-Miles offered	10,090,700	9,131,200	+10.5%
Load Ton-Miles sold	5,836,400	5,167,000	+13.0%
Revenue Load Factor	57.8%	56.6%	+ 2.1%
Passengers carried	126,579	119,829	+ 5.6%
Passenger Miles flown	46,845,000	42,287,000	+10.8%
Passenger Load Factor	55.5%	55.1%	+ 0.7%
Freight Ton-Miles	964,200	793,500	+21.5%
Mail Ton-Miles	313,700	290,200	+ 8.1%
Aircraft Miles flown	1,929,000	1,864,000	+ 3.5%
Revenue Hours flown	10,184	10,798	− 5.7%

A Cry for More Freedom

LAST week the Association of British Chambers of Commerce sent to the Minister of Transport and Civil Aviation a report in which much greater freedom for air carriers is demanded as the only means by which British air transport may be expanded. The report—produced by a working party set up by the council of the Association in March, 1958—maintains that the present restrictive laws seriously curtail the British civil aviation effort and are not in the interests of the travelling public.

In brief, the Association believes that the Government should:—

1. Stimulate greater competition by allowing more than

one British operator on each route and by amending Section 24 of the Air Corporations Act, 1949, so that independent carriers can operate scheduled services in their own right.

2. Reconstitute the Air Transport Advisory Council to give it statutory powers to license both internal and international services, and to control traffic rights exercised under bilateral and multilateral international agreements.

3. Stimulate the development of internal services and a greater number of direct air links between provincial centres in the United Kingdom and Europe, by freely granting licences to operators who meet the required technical standards and are able and willing to run such services, and so encourage local authorities to own their own airports.

4. Re-establish the Ministry of Civil Aviation as a separate Ministry to encourage the development of air transport generally.

The conclusions reached in the report are to the effect that the Air Corporation Act gives an unfair advantage to the nationalized Corporations in that no independent carrier can operate a scheduled service in its own right, but only by means of an associate agreement with a Corporation; and that the network of routes reserved exclusively to the Corporations contains such a preponderance of the worthwhile routes that the development of new and parallel routes by independent operators is stultified to the detriment of the travelling public and the industry.

The time has come, the Association also believes, to reconsider the question of whether the Minister charged with the responsibilities for civil aviation should not be free to devote his whole and undivided attention to civil aviation. The Association considers that greater competition should be stimulated by licensing more than one operator on each route and that this would lead to an improvement of the British effort, "both in ingenuity and weight," on each international route from the U.K. If international reciprocal rights are put up as an objection to such a course of action, at least a step in this direction could be taken on cabotage routes.

The Air Transport Advisory Council, the Association believes, should be given statutory powers enabling it to license Corporations and independent operators to operate international and domestic scheduled services, to control frequencies, to govern fares and amenities, and to act as the British representative in negotiations with foreign Governments over the clearances required to give effect to the licences granted by the Council. Reasons for the rejection of applications should be given and there should be a right of appeal from its decisions.

Future Transport Possibilities

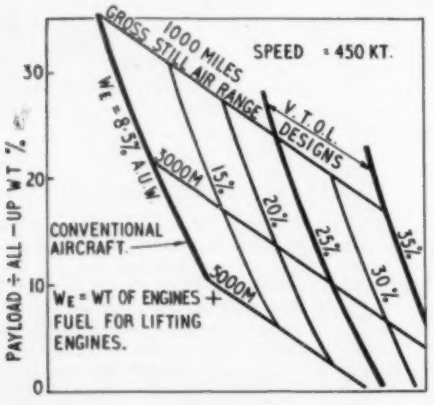
Some thoughts on possible lines of development of air transport—with particular reference to the supersonic aeroplane—by* SIR GEORGE GARDNER, *director of the R.A.E.

IN the course of a far-reaching survey of "Some Aspects of Future Air Transport Possibilities," given before the Canadian Aeronautical Institute,* Sir George Gardner discussed, amongst other things, the prospects for laminar flow, VTOL/STOL aircraft, hypersonic gliders and supersonic transports. He also considered the possible volume of air traffic and the effect on it of cost, and dealt extensively with the problems of automatic landing and the work of the B.L.E.U. in solving these problems. Since it is not possible to publish the whole of this interesting lecture here, we have extracted, almost verbatim, the section dealing with supersonic transports, and have summarized Sir George's views about other possible aerodynamic advances. (The work of the B.L.E.U. on automatic landings was described in THE AEROPLANE for October 17, 1958.)

The Supersonic Transport

The rapid advances made in recent years in aerodynamic, engine and intake efficiency will permit reasonably economic supersonic flight, Sir George said, but so far as can be foreseen now, the direct operating costs are unlikely to be less than those of existing subsonic jets.

* Sir George's paper was presented at the C.A.I. Special Anniversary Meeting in Montreal on February 23 and 24.



Payload percentages of all-up weight plotted for conventional and VTOL aircraft types.

Whether the increased speed will attract the greater load factors which will be demanded by the need to keep in a strongly competitive market, is a matter for speculation and not for technical judgment. It can, however, be safely assumed that once a manufacturer produces a design for a supersonic aircraft whose estimated costs approach existing levels, and once he can persuade a major airline to order a reasonable number of them, other operators will be subjected to intense pressures to follow suit.

A rough approximation to the direct operating costs of a long-range civil aircraft is given by

$$C = \frac{a\ W_F}{S\ W_P} + \frac{b\ W_B}{V_B\ W_P}$$

where C is the direct operating cost per ton-mile

a and b are constants
S is the stage length
V_B is block speed
W_F is fuel load
W_B is equipped airframe weight
W_P is payload.

The first term in the equation covers fuel costs and the constant, "a," depends on the price of fuel per gallon and the properties of the fuel load used on the average journey. The second term covers such items as depreciation, amortization, maintenance and crew costs.

In general, fuel costs will increase with speed mainly because of the large reduction of L/D, which will increase the fuel load required for a given range and/or reduce the payload available.

The other-than-fuel costs in the second term above will be reduced by the direct effect of speed, which, in effect, enables more work to be done with a higher earning capacity for the same maintenance, depreciation costs, etc., but will also be increased because of the reduced payload available in a given airframe as a result of the increased fuel load. Both these effects roughly tend to cancel out, so that the variation in other-than-fuel costs with speed tends to be less than the variation in fuel cost.

Typical values for transatlantic operators using current values for lift/drag ratio, etc., for fuel and other-than-fuel costs are given below.

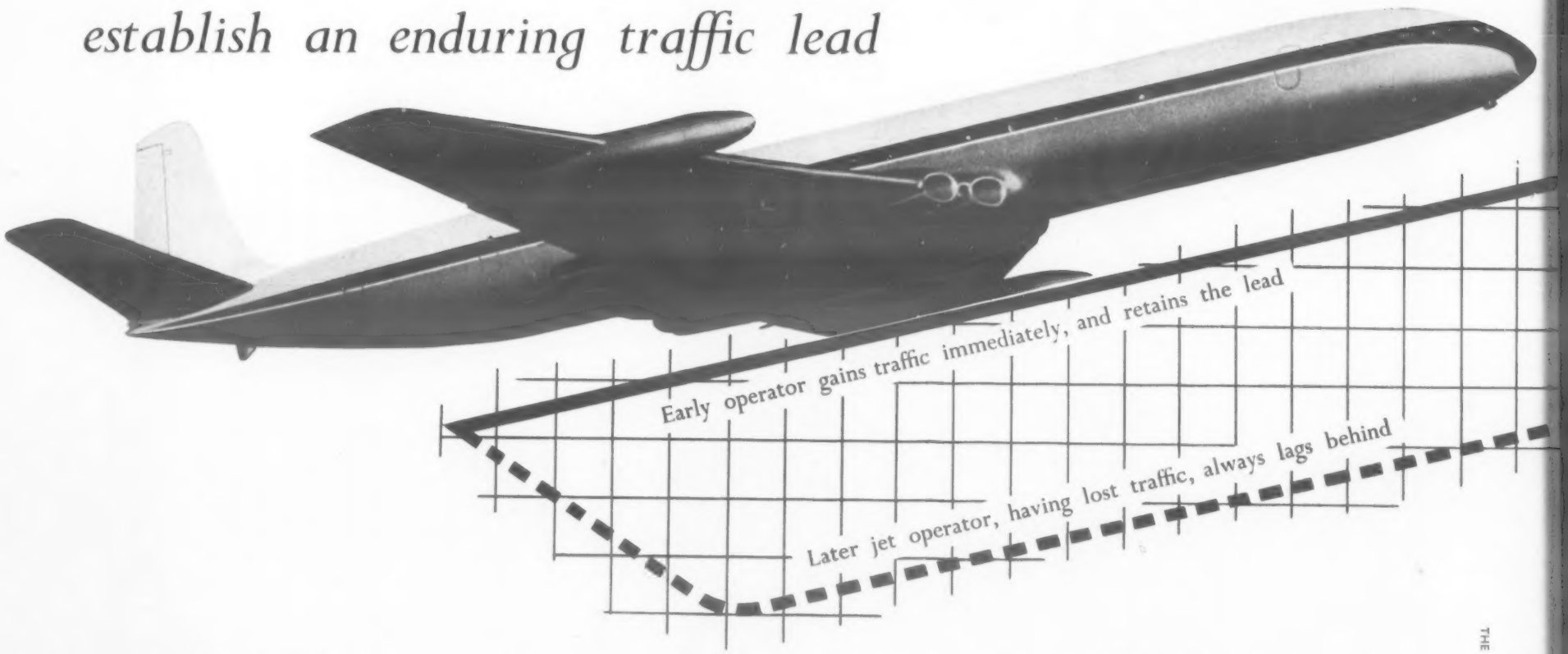
Cruising Mach No.	0.8	1.2	1.8	2.6
Fuel costs, pence/short ton/statute mile	3	5	10	12
Other-than-fuel costs, pence	9	9	9	10
Direct costs, pence	12	14	19	22
Indirect costs, pence	12	12	12	12
Total of operating costs, pence	24	26	31	34
Ratio to present-day subsonic jets	1.0	1.08	1.3	1.4

In the table it is assumed that the indirect costs, such as

(*Continued on page 427*)

Airlines that are early with the COMET

establish an enduring traffic lead


Early operator gains traffic immediately, and retains the lead
Later jet operator, having lost traffic, always lags behind

The COMET jet airliner

(Rolls-Royce Avon engines)

Earliest delivery—the right-sized jet at the right time
Can go everywhere—easily uses existing airports
Pays its way on moderate traffic—and high frequency
Superlative jet comfort and jet speed
A known quantity—proven aircraft, proven engine

D E H A V I L L A N D

THE AEROPLANE, APRIL 10, 1959

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GOODYEAR AVIATION DIVISION

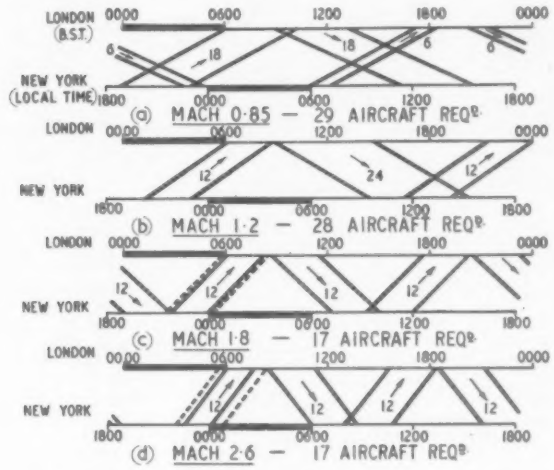
SERVING AVIATION THE WORLD OVER

(*Continued from page 426*)

publicity, sales service and overheads are constant at 12d. per short ton statute mile. At present it would appear that estimates of such costs depend critically on the bookkeeping systems used by particular airlines. In practice one might assume that the increased traffic that can be handled with the higher speeds should lead to some reduction in such costs and so the cost penalties of the higher speeds should be lower than those given in the table.

The most significant effect of speed is, of course, the increased traffic that can be handled with a given size of fleet. As discussed above, this reduces maintenance and depreciation costs, as well as indirect costs or overhead costs.

Typical timetables for four types of aircraft over the London-New York route are illustrated. These aircraft have cruising speeds of M=0.85, 1.2, 1.8 and 2.6, each speed being approximately 50% higher than the last, and all aircraft carry the same number of passengers. The traffic is assumed to require 24 trips per day in each direction and the operational limitations are a three-hour turn-round time at London and two-hour turn-round at New York.



A visualization of timetables on the London-New York for aircraft of four different cruising speeds. The upper line in each case represents a 24-hour period in London, the lower that in New York. Diagonal lines represent transatlantic crossings with a 15-minute frequency; the number of crossings in each batch is indicated by figures.

The periods from midnight to 6 a.m. are undesirable arrival or departure times. At subsonic speed (journey time approximately seven hours) 24 aircraft can each manage one return trip per day, all with desirable arrival and departure times. In addition, three aircraft grounded for routine checks and one spare aircraft at each end of the route make up a fleet of 29. This gives a peak utilization, annually, of 4,000 hours per aircraft.

At M=1.2 (journey time approximately five hours) 24 aircraft can still only manage one return trip per day, but with more spare time. Thus one spare aircraft is sufficient and a fleet of 28 is required with peak utilization 3,200 hours.

At M=1.8 (journey time approximately three and a half hours) 12 aircraft can manage two return trips per day each, though, if a 15-minute service is used, two trips either arrive or depart during the night, denoted by the dotted lines. As these aircraft have little spare time during the day, two reserve aircraft are required and a fleet of 17 with 3,500 hours' utilization is the answer.

At M=2.6 (journey time approximately two and a half hours) two return trips per day are still all that can be arranged and more night trips are necessary. A fleet of 17 aircraft, with utilization down to 2,600 hours and a less attractive timetable results.

Thus, the value of speed is a step function—going to M=1.2 does not, in this particular case, and with the assumptions outlined above, confer any reduction in the size of fleet, but M=1.8 offers a significant reduction.

Such answers depend critically on the turn-round times assumed. If these could be reduced to, say, one hour at New York and two hours at London, it would be possible to operate three crossings per day with the M=1.2 aircraft and five crossings per day with the M=2.6 aircraft, and the fleet sizes would be correspondingly reduced. Nevertheless, it is probably true that for any particular route there is a particular speed above which significant reductions can be made in the size of fleet to cope with a given load. Such questions may be of dominating importance in choosing the next generation of civil transport aircraft.

A final point is the much-discussed possibility of VTOL for supersonic transports; this, it has been suggested, will permit the design of an aircraft to be uncompromised by the take-off and landing restrictions that normally apply. The author believes that, not only will the stowage of vertical-lift engines and their satisfactory control create equivalent problems but that the weight penalties and maintenance costs will make an economic civil transport aircraft using such devices difficult to achieve in the near future. VTOL schemes have a promising future, but they must expect to earn their place by performing tasks entirely different from those at present undertaken by conventional civil transports. The first generation of supersonic civil aircraft will use conventional aerodromes and concrete will continue to play an important part.

Laminar Flow

Laminarization of a turbojet aircraft designed to carry a 40,000-lb. payload over the transatlantic stage-length of about 3,000 n.m. should lower direct operating costs by about 15%, assuming the same first cost and the same maintenance costs per pound of airframe weight. Total operating costs would be about 7% lower, the gains coming almost entirely from the smaller fuel quantities required. At 5,000-mile stage lengths, the reduction in costs should be 28% and 15% respectively.

Although further research and operational problems remain to be solved before this promising idea could be applied to a large transport aircraft, there is a real incentive to solve them.

VTOL/STOL

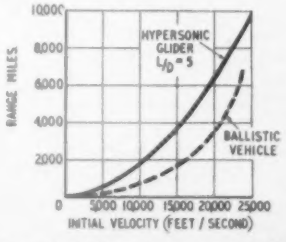
All VTOL and STOL schemes at present proposed involve some appreciable performance penalty. In this respect the runway remains the most efficient and simple means of getting an aircraft into the air with the aid of an undercarriage, and the author believes that when a medium or long runway is available it will be used. The efficient use of STOL/VTOL devices demands an aircraft which has to be specially designed from the start. In fact, the major key to a successful aircraft of this type is the development of a lightweight, efficient powerplant.

The importance of engine weight for the VTOL is illustrated (previous page) with the carpet of percentage payload which can be offered for a series of aircraft of given speed for various ranges and powerplant weights. Total powerplant installed weight for conventional aircraft is about 8-9% of all-up weight, and the thrust-weight ratio is about 0.25. For the VTOL, the powerplant weight is about 30% of the A.U.W. to give a thrust-weight ratio of 1.2.

The economic account of VTOL, therefore, seems at present to be rather heavily against an easy passage to acceptance, except in some special applications. In general, VTOL configurations can become STOL merely by overloading, and there will be pressure to reduce costs by using them as often as possible in this manner.

Hypersonic Glider

From the present transport viewpoint it is seldom that stage lengths of more than 3,000 n.m. are required; it is therefore found that, as cruising speed rises, the accelerations and decelerations occupy more and more of the total flight time. We should therefore tend to use the large amount of kinetic energy built up in the acceleration phase as efficiently as possible, so that the journey is mainly accomplished during deceleration. Thus results the hypersonic glider concept, a vehicle skimming through the edges of our atmosphere at speeds approaching that of satellites, and ballistic flight where the journey is accomplished outside the atmosphere.



The range of hypersonic and ballistic vehicles.

The problems thrown up by such flight techniques will be formidable—in particular the heating and decelerations involved on reaching the denser regions of the atmosphere and the control of the flight path—but there seems to be no reason to doubt our ability to surmount them.

The Pr
Da

Top left, 16 Vampires of the Advanced Flying Wing making their fly past over the R.A.F. College, Cranwell, as the Prime Minister proceeds to the saluting base. Above, Mr. Macmillan, accompanied by Air Marshal Sir Hugh Constantine (left), and the Commandant, Air Cdre. D. F. Spotswood, waiting on the edge of the parade ground for the Vampire fly past.

Left, the Prime Minister inspecting the Cadet Wing during his visit to the R.A.F. College. Below, inspecting a Handley Page Victor B.1 crew in the static aircraft park at R.A.F. Cottesmore before going to the operations caravan to give the "scramble" signal to four Victors of Nos. 10 and XV Squadrons.

Aircraft on display for the Prime Minister's visit to R.A.F. Cottesmore included various types demonstrating the Service's different operational rôles. Below, left to right, the Bristol 192 helicopter, which is in production for the R.A.F., an Avro Shackleton MR.3 from Coastal Command, the Armstrong Whitworth 650 Argosy from which the military A.W.660 is derived, a H.P. Victor B.1 and an English Electric Lightning.

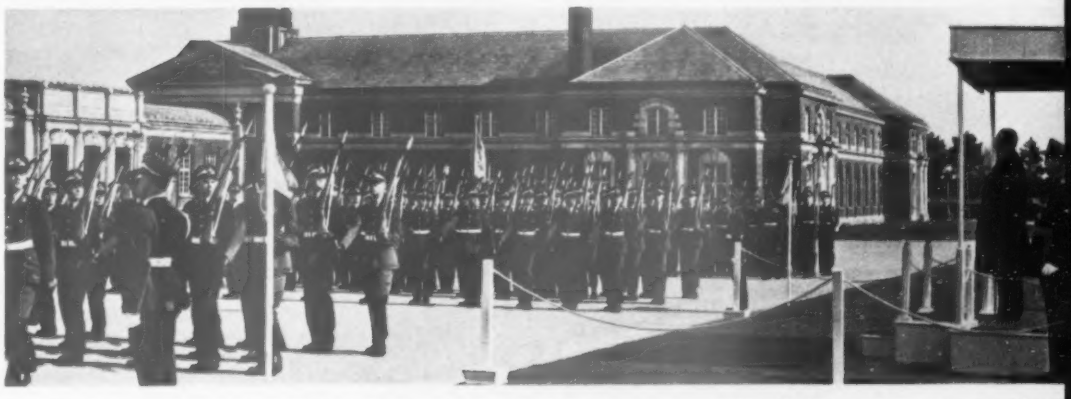
ime Minister's
y with the R.A.F.

Photographs copyright "The Aeroplane"

Above, the Prime Minister saluting the Colour during the parade at R.A.F. Cranwell.

Above, Paratroops lined up in front of a Blackburn Beverley at R.A.F. Cottesmore. During his tour of the station, the Prime Minister also visited the Electronics Centre and saw a selection of guided missile equipment and models in an indoor exhibition.

Right, at Cranwell the Cadet Wing, with the Queen's Colour, marched past in review order in slow and quick time.



The Fighting Services

Senior Appointments

AIR VICE-MARSHAL D. R. EVANS, C.B., C.B.E., D.F.C., is to become Commandant of the School of Land/Air Warfare, Old Sarum, on May 1, 1959. Senior Air Staff Officer, Fighter Command, from January, 1957, until October of last year, Air Vice-Marshal Evans completed the 1956 course at the Imperial Defence College, having previously been Director of Operational Requirements (B) at the Air Ministry for three years. Before that he was on the directing staff of the Joint Services Staff College.

Group Captain J. D. Ronald, A.F.C., has been appointed Director of Personnel (Air) at the Air Ministry with the acting rank of Air Cdre. Since 1945 he has served in Germany, in the Deputy Directorate of Air Tactics, and in 1949 became C.O. of R.A.F. North Weald. From 1951 to 1954 he commanded R.A.F. Sylt and for the past three years has been at the Air Ministry, latterly as a Deputy Director of Personnel.

The R.A.F. at Las Vegas

THREE Avro Vulcan B.1s of No. 617 Squadron are to represent the R.A.F. at the first World Congress of Flight to be held at Las Vegas, Nevada, from April 12 to 17. The Bomber Command detachment will be commanded by Air Vice-Marshal G. A. Walker, C.B.E., D.S.O., D.F.C., A.F.C., A.O.C., No. 1 Group, who is flying to the United States as co-pilot of one of the Vulcans.

North American Visit

A PARTY of 30 flight cadets from the R.A.F. College, Cranwell, are visiting Canada and the United States this month. They are returning a visit made to this country last year by cadets of the U.S.A.F. The cadets are all training for flying duties and have reached their senior year at the College.

Photograph copyright "The Aeroplane"

R.A.F. TRAINED.—Among the student pilots who completed their flying training at No. 8 F.T.S., R.A.F. Swinderby, on March 25, were a number of officers in the Indonesian Navy. These officers are destined to be the nucleus of the Indonesian Naval Air Arm. Standing in front of Air Cdre. E. M. Donaldson, the reviewing officer at the Passing Out Parade, Dr. Sunario, the Indonesian Ambassador, is seen congratulating one of the Indonesian pilots.

R.A.F. PROMOTION.—Air Marshal Sir Hubert L. Patch, K.C.B., C.B.E., who took up the appointment of Air Member for Personnel on April 1, has been promoted to the rank of Air Chief Marshal with effect from the same date. Commander-in-Chief, M.E.A.F., since September, 1956, he was A.O.C.-in-C., Fighter Command, from January until September, 1956. Before going to Headquarters, Fighter Command, he was A.O.C., No. 11 Group.

The party, headed by the Commandant of the College, Air Cdre. D. F. Spotswood, C.B.E., D.S.O., D.F.C., and accompanied by the Director of Studies, Mr. Anthony Constant, M.A., were to leave on April 4 in a Comet 2 of Transport Command. Their first visit will be to the Royal Military College of Canada at Dingston, Ontario. Flying south, the cadets will tour the Headquarters of Strategic Air Command at Omaha, Nebraska, and then spend four days at the U.S.A.F. Academy at Colorado Springs.

For the latter part of the tour the party will stay in Washington, using the capital as a base from which to visit U.S.A.F. units. They will return to the United Kingdom on April 17.

The R.A.F.A. in 1958

DETAILS of the progress made in the welfare work of the R.A.F.A. are given in the Association's Annual Report and Treasurer's Report and Statement of Accounts for the year ended December 31, 1958, published last month.

In his foreword to the Annual Report, the Chairman of the National Council, Air Marshal Sir Harold T. Lydford, K.B.E., C.B., A.F.C., stated that the membership of the Association was being maintained and stressed that the importance of "Wings Day" as a means of financing the welfare work of the R.A.F.A. cannot be over emphasized. Although the results for 1958 were satisfactory, Sir Harold pointed out that there are still many branches who should reconsider the desirability of organizing a "Wings Day" collection in their area to help the welfare work of the Association.

The Treasurer's Report showed that the financial results of the Association's activities in 1958, although less encouraging than in the previous year, can be regarded as satisfactory, bearing in mind the greatly increased momentum given to its work. With one exception all the Areas balanced their accounts, and made it possible for the R.A.F.A. as a whole to pay its way on administration.

R.A.F. Appointments

THE following are among recent Royal Air Force appointments:—

Air Ministry: Gp. Capt. G. P. S. Pollard, C.B.E., to be Inspector of Recruiting; Wg. Cdr. H. E. Walmsley, D.F.C., to the Department of the Air Member for Personnel; Wg. Cdr. H. L. E. Watson to the Department of the C.A.S.; Sqn. Ldr. P. Green to the Department of the C.A.S., with acting rank of Wg. Cdr.

Fighter Command: Sqn. Ldr. D. G. Evans to R.A.F. Coltishall to command the Flying Wing, with acting rank of Wg. Cdr.

Bomber Command: Wg. Cdr. W. M. Dixon, D.S.O., D.F.C., A.F.C., to Headquarters to command Operations Centre.

Maintenance Command: Gp. Capt. D. H. M. Graham, O.B.E., to No. 7 M.U., R.A.F. Quedgeley, to command.

Technical Training Command: Wg. Cdr. A. T. Arnold to R.A.F. Innsworth for administrative duties; Wg. Cdr. T. Molloy to the R.A.F. Institute of Aviation Medicine, Farnborough, to command Administrative Wing.

R.A.F. Germany (2nd T.A.F.): Wg. Cdr. P. C. Ellis, D.F.C., to Headquarters for Flight Safety Duties; Wg. Cdr. W. C. Horder to the communications and Support Group Headquarters; Wg. Cdr. S. C. Dunmore, A.F.C., to R.A.F. Wildenrath to command No. 88 Sqn.

Middle East Air Force: Wg. Cdr. G. F. Morley-Mower, D.F.C., A.F.C., to Headquarters for Air Planning duties.

Miscellaneous: Wg. Cdr. D. F. B. Sheen, D.F.C., to Headquarters, Allied Air Forces Central Europe, as Plans Officer.

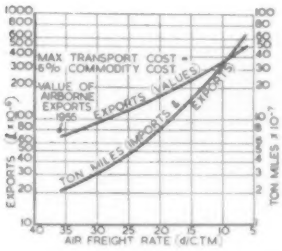
Variations on a Freighting Theme

The present air-cargo market prospects and fleet requirements are discussed in relation to two specialist freighter developments of the basic Britannia design—the Britannic and the CL-44

FOR years people in air transport have been talking about the great freight expansion which was just around the corner—and for years this expected increase has failed to materialize. There have been major regional developments in the air-freight market and a fairly steady rate of increase in World freight movements has been recorded year by year, but there has been nothing dramatic about progress and between 1957 and 1958 there was, according to ICAO statistics, hardly any increase worth mentioning.

During the past few months, however, something has been happening—at least so far as the business in the U.S.A. is concerned. Nobody appears to be quite sure why this upsurge of interest in air freight should have developed, but it is more than likely that it is the natural result of successive years of sales effort which may have appeared to be unsuccessful, but which is now, at last, showing results.

Certainly an increase of this kind is not likely to continue without vigorous sales and organizational effort, but the effect of the increase will be that of encouraging the sales effort, the necessary streamlining of air freight business methods and the co-ordination and planning of the ground services which will make possible further rapid increases in offered traffic and a steady lowering of the rates which are charged.


MAX. TRANSPORT COST = 6% COMMODITY COST
VALUE OF AIRBORNE EXPORTS 1955
EXPORTS (VALUES)
TON MILES (IMPORTS & EXPORTS)
EXPORTS (£ x 10⁶)
TON MILES x 10⁻⁷
AIR FREIGHT RATE (d/C.T.M.)

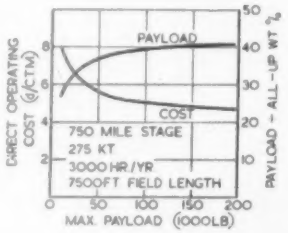
A curve showing the increase of U.K. freight traffic which can be expected with reducing freight costs. This and the curve opposite were used by Sir George Gardner in his paper reviewed on pages 426-427 of this issue.

Until now the air-freight increases have been the natural result of an expanding realization of the benefits of this method of transport rather than the effect of lowered charges or improved facilities. There has been something in the nature of a vicious circle in the air-freight business; without tariff reductions there could be no very great increase in traffic and without an increase in traffic offering there could be no incentive to design and manufacture, or for operators to order, the kind of aircraft which would make useful tariff reductions practicable.

Such aircraft are still very much in the future, but, at least in the U.S.A., the traffic prospects are beginning to give the kind of encouragement which will make the fast, medium-haul, really big-capacity freighter—and even the specialist turbofan freighter—a practical proposition for the industry. A 250,000-lb. aircraft carrying, say, a 100,000-lb. payload over stages up to 2,000 miles could offer the prospects of direct costs of about 2½-3 cents per short ton/statute mile—or perhaps about 8-10 cents to the shipper instead of the present minimum rate of about 25-30 cents per ton/mile.

Support for the theoretical prospects of air freighting has been offered by Mr. Frank Robertson of Short Bros. and Harland. On the assumption that any commodity will bear 5% of its value as the cost of air shipment, he has calculated that, for the entire United Kingdom import and export potential, a halving of the 1955 average air freight rate of about 36d. (42c) per ton/mile would increase traffic by some 500%.

But aircraft capable of doing a better job, in terms of operating economy and money-saving turn-round efficiency, than the modified passenger transports are wanted now for interim use pending the future appearance of the super freighters. The announced order from an unnamed U.S. all-freight carrier—assumed to be Seaboard and Western Air-



How payload affects the direct operating costs of a freighter. A hypothetical study with assumptions as indicated on the figure.

lines—for five Canadair CL-44s is one sign of the way in which things are moving.

Another, of a slightly different kind, but still in the long-haul field, is the decision of American Airlines to convert 10 passenger DC-7Bs for all-freight use this year; American is, at present, the World's largest carrier of freight, fill-up and specialist, in terms of ton-miles flown. More important, perhaps, is the purchase by Riddle Airlines for an unspecified number (believed to be four as an initial order) of Armstrong Whitworth Argosy freighters—which are aircraft for a more specialist short-medium-haul all-freight market. Fill-up freight movements are likely always to remain as jam on the bread-and-butter of airline passenger-fare incomes, but there is likely to be an accelerated increase in scheduled all-freight operations with specialized vehicles.

There is no doubt that the development of interim freighters as well as of more sophisticated vehicles will be accompanied by a similar development of ground-handling systems and organization. The levels of speed, economy and efficiency, necessary to interest shippers as well as to bring down costs, will demand special loading and packing systems, including those of pre-loaded pallets, and such Customs-procedure simplifications as open crates.

The question of whether really large-diameter fuselages will be necessary remains to be seen as rates come down and a wider variety of shipments are being offered. At present there is an obvious need for direct-loading in place of the side-doors of existing conversion-type freighters, but present fuselage dimensions do not seem to be too small for the kind of loads which are being carried. Just now it appears that, in the U.S.A., only about 1% of the offered freight is too bulky for air transport and that its average density is higher than had

BRITANNIC AND CL-44 DATA COMPARISON

	Britannic	CL-44D-4
Powerplant	Tyne	Tyne 515/10
Take-off power, each		5,730 e.h.p.
Span	148 ft. 3½ in.	142 ft. 3½ in.
Gross wing area		2,075 sq. ft.
Overall length	134 ft. 0 in.	136 ft. 8 in.
Ove-all height	47 ft. 0 in.	38 ft. 7 in.
Fuselage interior width, floor level	12 ft.	11 ft.
Fuselage interior height	12 ft.	6 ft. 8 in.
Fuselage capacity, excluding flight deck		6,380 cu. ft.
Floor height above ground		
Gross weight	195,000 lb.	205,000 lb.
Zero fuel weight		155,000 lb.
Landing weight		165,000 lb.
Max. payload	75,000 lb.	65,000 lb.
Max. fuel capacity		10,150 Imp. gal.
Continuous cruising speed	310 knots	320 knots at 26,500 ft. at 164,400 lb.
Range with max. fuel	4,750 naut. mi.	5,600 naut. mi. (no reserves)
Take-off field length (CAR 4b), I.S.A. at s.l.		7,660 ft.

been thought earlier and is settling down at something like 13-14 lb./cu. ft.

However, there is likely to be a steady increase in the bulk of loads and the large fuselage may well be necessary in the future—if too high a price does not have to be paid for it in terms of drag and lowered cruising speed. Within reason, speed is very much the essence, and the successful medium-long-haul freighter of the future is likely to need a minimum cruise speed of 400 knots—though not necessarily higher than 450 knots—in order to keep the flight duty period on long hauls down to a figure which will remove the necessity for the use of slip crews. On the other hand all-freight carriers have not the same incentive as the passenger-carrier to make long-haul runs non-stop; no operator likes carrying fuel around and the all-freight carrier's optimum stage-distance requirement is likely always to be comparatively low.

Among the long-haul, big capacity, all-freight aircraft at present on offer, particular interest centres at the moment upon two types which, as it happens, are both direct derivatives of the Bristol Britannia 300 series, and therefore can conveniently be discussed in a single article. These are the Britannic, which is being developed as a military transport for the R.A.F. by Short Bros. and Harland and which may be available to civil operators in, say, 1964; and the Canadair CL-44 which will be available for service in 1961. Bristol Aircraft, too, are known to have been developing the design of a rear-loading variant of the Britannia which could be available to operators in 1961.

Other prospective freighters are on the market, including possible commercial versions of the U.S.A.F.'s C-130 Hercules and C-133, and all-freight variants of the Boeing 707, DC-8 and Convair 880. For various reasons, these types appear to commend themselves less, at present, to the specialist all-freight operators, but the possible availability of surplus C-130s and other types in five to 10 years may influence the purchase of new aircraft.

The background and general characteristics of the Britannia derivatives are described separately below.

Short's Freighter

One of the reasons given officially for choice of the Short Britannic rather than faster turbojet transports as a strategic freighter for R.A.F. Transport Command is that its commercial prospects are good. Production aircraft—for the R.A.F.—are expected to be available in 1962, but there is no immediate programme for certification as a civil freighter and Shorts anticipate that an aircraft of this size probably will not be wanted until 1963 or 1964 by the freight operators.

It was in April, 1956, that Short's project design department first began to think around the design of a big freighter aircraft. At that time David Keith-Lucas (technical director) and Frank Robertson (chief project designer) were visiting K.L.M. with the object of introducing the airline to the company's PD.16—a design for a freighter aircraft of 69,000-lb. all-up weight, carrying a payload of 25,000 lb. and with maximum range of 2,000 n.m. In the event, since no Government order seemed likely, this project was not pursued.

The visit to Holland was in the nature of a market probe. The views of K.L.M., as one of the World's leading freight carriers, were considered authoritative and it was the airline's lukewarm attitude to the PD.16 that set Shorts "thinking big." In their assessment of the future of the freight-carrying business, K.L.M. were thinking in terms of an aeroplane that would be able to carry a really big load over really long distances. It should, they considered, be able to cross the Atlantic, carrying anything from 25-40 tons of payload over block distances of 3,200 and 3,800 miles at a cost of about 5 cents/ton-mile.

Shorts at once began to consider the possibilities of transatlantic freighters. Several designs were sketched out using both jets and propellers. It quickly became clear that, to achieve really good operating costs on the North Atlantic, a big turboprop aircraft was needed. Turboprop power was chosen for three reasons: An aircraft so powered will be cheaper to operate so long as vast quantities of fuel are needed to cover such contingencies as engine cuts, stand-offs and diversions; the speed necessary to make a turbojet transport economically effective is difficult to achieve with a fuselage conditioned by the need to accommodate all kinds of loads; and a freight aeroplane must fly to and from places which are unlikely to have long runways. As the Short project team sees it, a freight aeroplane with propellers scores hand over fist by reason of its ability to operate from airfields much smaller than those usable by turbojets.

THREE BRITANNIC VARIANTS

		1	2	3
Max. t.o.w.	lb.	180,000	183,500	195,000
Max. payload	lb.	60,000	60,000	75,000
E.S.A. range with max. payload	n.mls.	1,000	1,170	1,280
Max. E.S.A. range	n.mls.	4,150	4,450	4,750
Payload for max. E.S.A. range	lb.	11,110	13,380	28,800
Cruising speed	kts.	287	310	310

In the early days of the Britannic project the biggest engine available was the Bristol Orion and a number of studies were prepared around this engine. A characteristic of all of them—as indeed it has been of most of Short's preliminary designs in recent years—was the high wing. There were a number of reasons for this. Shorts believe that, aerodynamically, the high wing aeroplane is a great deal more efficient than any other type, while being structurally little, if any, heavier. Another factor in this case was the particular need for a freight aircraft to cut down turn-round time. The high wing enables the fuselage to be close to the ground.

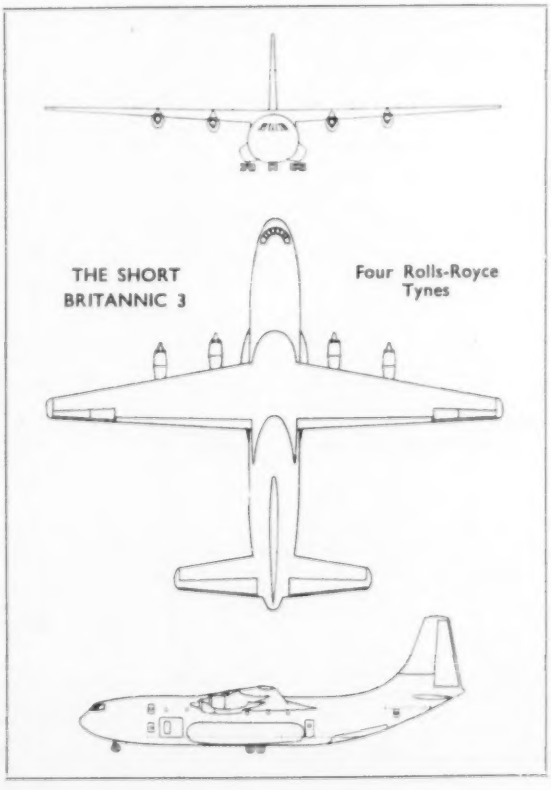
Working on these basic principles, Shorts found that with four Orion engines they could design an aircraft able to carry some 25 tons of payload over the Atlantic at a cruising speed of 360 knots. The project was pursued on low priority because it was more than usually speculative and other ideas, of apparently more tangible promise, took precedence. When, later on, it became clear that there was no assured future for the PD.16, Shorts took another look at the big freighter project.

The suggestion that Britannia components should be used came from Short's chairman, Rear Admiral Sir Matthew Slattery. This was towards the end of 1956. The evolution of the Britannic design dates from that time. By March, 1957, the initial preliminary design had been prepared and since then has been circulated to airlines throughout the World.

A number of variants have been studied. One or two of these are considerably advanced versions, but for the purposes of this article it is sufficient to mention only three:—

Britannic 1. This embodied the minimum possible number of changes from the Britannia. It had the same all-up weight, the same engines (Proteus 755), the same propellers and the same undercarriage. The only differences were that it had a high wing and a new fuselage about 50% larger.

(*Continued on page 433*)



POWER FOR SUPERSONIC AIRCRAFT

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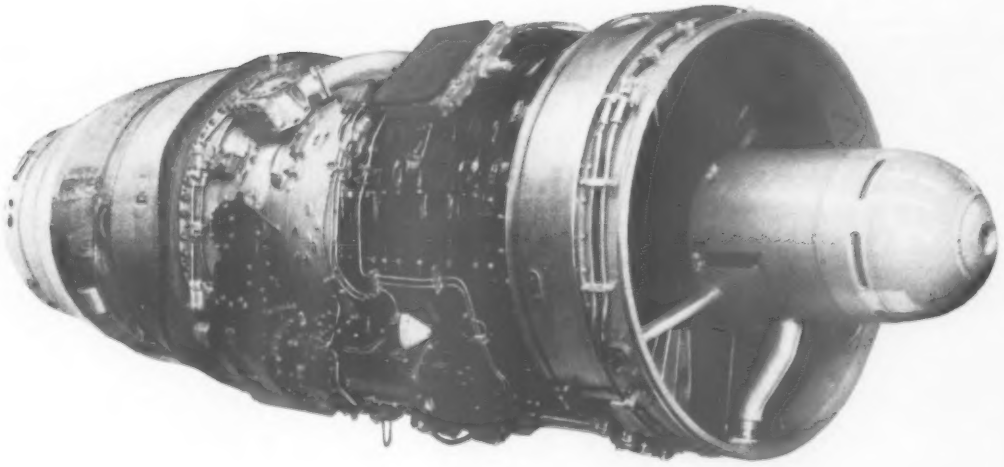

Avons are in quantity production at a rating of 11,250 lb. dry thrust and are being developed to deliver considerably higher powers with and without reheat. They have flown more than 2,000,000 hours and are installed in fighters, bombers and transports including the Commonwealth Sabre, the de Havilland Comet 2 and Sea Vixen, the English Electric Canberra and Lightning, the Hawker Hunter, the S.A.A.B. Lansen and Draken, the Vickers Valiant and the Vickers Supermarine Scimitar.
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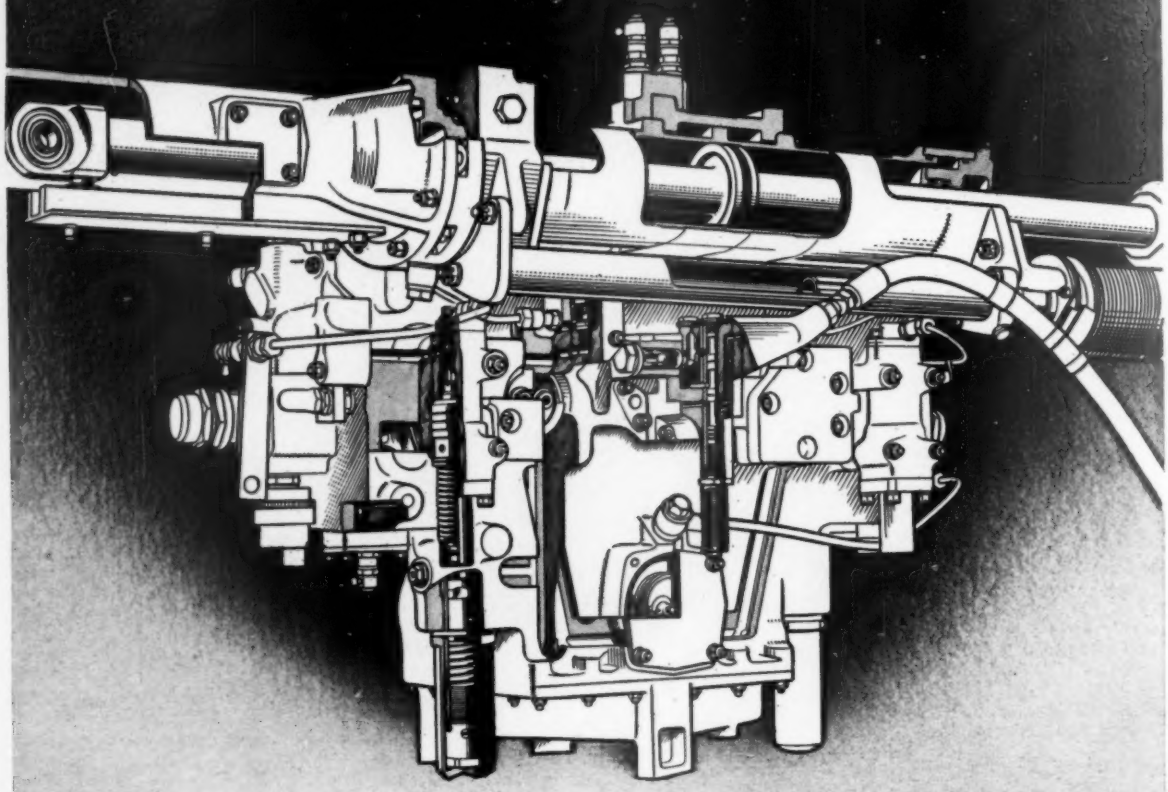

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(*Continued from page 432*)

Britannic 2. This used a development of the Proteus with greater power, improved specific fuel consumption, an advanced type of propeller and a new undercarriage.

Britannic 3. This was the first mark to use the Rolls-Royce Tyne, the Orion having gone out of the picture. The engine nacelles in this mark were redesigned and made considerably smaller.

Although based on the Britannia 310's wing and tail unit, the Britannic 3 will be very largely a new aeroplane. The fuselage is completely new and provides a greater cross-section than that of either the Britannia or the CL-44, while moving the wing to the top of the fuselage gets rid of the encumbrance of the spar at or below floor level. As a result of the wing shift a new undercarriage has been necessary.

Rear loading is provided through a " beaver-tail," one portion of the hydraulically operated door forming the loading ramp and the other portion hinging up into the fuselage to provide a clear 12-ft. by 12-ft. opening. The fuselage provides an uninterrupted 60-ft. length at this cross-section, while the 20-ft.-long ramp can also be used for freight carrying; a 2-ft.-high skirting on each side of the floor provides a walkway giving access to the hold when loaded. The floor is at truck-bed height.

A grid of lashing points extends over the floor and up the walls to a height of 4 ft.; the floor points are stressed alternately for 5,000 lb. and 10,000 lb., and the wall points for 2,000 lb. For special cases, in the military rôle, points of 25,000 lb. and 35,000 lb. can be provided.

The Canadian Solution

Payloads of over 100,000 lb. and direct operating costs in the 2½ cents/ton-mile bracket should be possible by 1963 with the Canadair CL-44, which, of the various studies discussed here, seems most likely to be the first to obtain operators' approval. Indeed, as noted already, an order for five, plus an option on five more, has already been placed by one U.S. freight operator (believed to be Seaboard and Western) while another (the Flying Tiger Line) is negotiating for 10 more.

The CL-44 is a straightforward stretch of the Britannia design, in line with various projects conducted by Bristol a few years ago, and is itself the latest in a series of Canadian studies going back to 1952, when the two companies first entered into an agreement permitting Canadair to produce a modified Britannia for the R.C.A.F. as a maritime reconnaissance aircraft. Early in 1957, the R.C.A.F. contracted with Canadair for eight CL-44 passenger and freight transports, and the first of these is expected to fly before the end of this year.

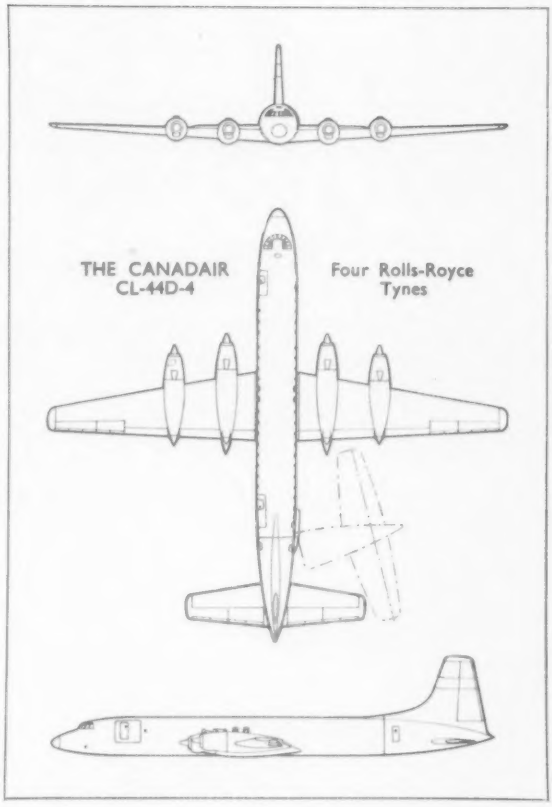
Compared with the military Britannia in production for the R.A.F., the CL-44 (or CC106 as it will be known to the R.C.A.F.) has a lengthened fuselage, higher gross weight and Rolls-Royce Tyne engines—finally selected after several other possibilities had been considered, including R-3350 piston engines and Bristol Proteus and Orion turboprops.

The commercial cargo version of the design is designated the CL-44D-4 and is distinguished from the CL-44D as produced for the R.C.A.F. and offered for civil use, in having a rear-opening fuselage of the swing-tail type. This modification is a comparatively recent one, but was essential to provide the straight-in loading for palletized cargo which is rapidly becoming the first characteristic demanded by an all-freight operator. The plain CL-44D has two large cargo-loading doors in the fuselage side, measuring 93 in. by 76.8 in. and 120 in. by 78 in. respectively; in the D-4, the larger, rear door is deleted in favour of the hinged fuselage, and it is not proposed to fit windows in the freight-carrier's cabin, other than the two emergency exits over the wing.

A clear cabin length of 84 ft. forward of the hinge point is obtained in the D-4, plus 14 ft. from the joint to the rear bulkhead; main cabin width is 11 ft. at floor level. Total volume of the main cargo compartment is 6,380 cu. ft., including 770 cu. ft. aft of the hinge line, to which can be added 1,011 cu. ft. in the two underfloor baggage holds.

The cargo floor is designed for a loading of 300 lb./sq. ft. forward of the hinge and 150 lb. aft of the hinge. Six floor tracks are provided, on 20-in. centres, with 5,000-lb. cargo tie-down fittings on a 20-in. grid. The two outboard tracks are capable of providing for 10,000-lb. cargo tie-down points 40 in. apart.

The swinging-tail feature of the CL-44D-4 has called for considerable engineering ingenuity. Two large external hinges are provided on the right-hand side of the fuselage, 90 degrees apart, with a hydraulic actuater between to open and close the tail. Locking is by means of nine equi-spaced latches which transmit fuselage tension and shear loads. An inflated seal round the joint prevents pressure leakage. Each lock is designed for a 50% overload, so that, if any one fails, the load is shared by the two adjacent to it. An electrical safety system prevents take-off power from being applied unless all locks are secure.



Of four different methods of breaking the control runs investigated by Canadair, that chosen consists of providing bevel gearboxes each side of the break. These convert the rotary action of the torque tubes to the oscillating motion of a pair of levers, one on each side of the joint, which transmit the control movement across the joint by direct contact when closed, and merely separate on opening. No serious problems arise in transmitting the other services—electrical, hydraulic, anti-icing, etc.—across the joint.

General characteristics of the CL-44D-4 are tabulated on page 431, where it will be seen that the maximum payload for international operations is 65,000 lb. for a gross weight of 205,000 lb. Various weight savings which can be made in domestic operation might add two or three thousand pounds to this payload. In general, the R.C.A.F.'s CL-44D, and any civil versions will have the same characteristics, although the passenger payload will be space-limited at about 38,000 lb., including a maximum of 171 coach-class passengers seated six abreast.

With the Rolls-Royce Tyne R.Ty. 12s at their present rating of 5,730 e.h.p. for take-off and 4,975 e.h.p. max. continuous, the CL-44 can " grow " to 228,000 lb. gross weight before it becomes performance-limited. The CL44E is a projected development along these lines. Coupled with the higher gross weight would be a landing weight of about 210,000 lb. and zero fuel weight of about 200,000 lb. to provide an effective payload of over 100,000 lb., and, as already noted, direct operating costs perhaps as low as 2½ cents/ton-mile.

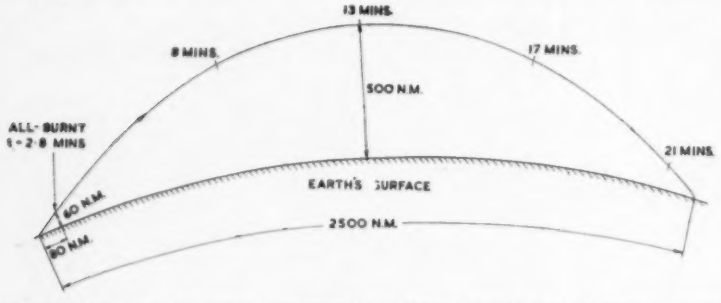
With the developed Tyne R.Ty.12, weights of up to 234,000 lb. can be foreseen, and this " stretch " could be taken out in terms of more range or more payload. Rather further in the future, and based on greater engine powers than offered by the present Tyne series, Canadair have preliminary studies going up to 300,000 lb.

Two other versions of the design are the CL-44F, a commercial variant of an airborne early warning proposal to the U.S.A.F., with a payload between that of the D and the E models; and the CL-44G, a tail-swinger similar to the D-4, but with the rear fuselage floor (aft of the wing spar box) dropped two feet to facilitate the loading of military vehicles and other bulky supplies.

Design of a 2,500-mile Missile

A recent lecture gives detailed information which may refer to Blue Streak, the British LRBM

A SINGLE-STAGE ballistic missile with a design range of 2,500 n.m. was discussed in detail for the first time recently when MR. E. C. CORNFORD, head of the R.A.E. guided weapons department, lectured to the Astronautics and Guided Flight Section of the Royal Aeronautical Society. It seems more than coincidental that his talk covered the design problems of a missile with the range which has been attributed to the Blue Streak, Britain's LRBM.



TRAJECTORY.—This is a typical trajectory for a ballistic missile with a 2,500-n.m. range.

The graphs and illustrations published here are taken from Mr. Cornford's lecture; the detailed information they give may well refer to the Blue Streak. Certainly it tends to confirm the assessment of this missile's potentialities which was published in THE AEROPLANE of March 27.

Trajectory

As shown above, the missile's trajectory allows for a powered phase of 2.8 min., with the cut-off at a height of 60 n.m. and a distance of 80 n.m. from the launching point. After cut-off the missile coasts on its ballistic trajectory up to its apogee height of 500 n.m., reached 13 min. after the launching, and then falls towards its target, which is 2,500 n.m. from the launching point.

Precise control of velocity at power cut-off is necessary to ensure accuracy at the target. Velocity at cut-off is somewhat under 18,000 ft./sec.; for each 2.6 ft./sec. error in this cut-off velocity there is a one-mile error in the impact point. It is not easy to appreciate the very accurate control of speed needed at cut-off; it is roughly equivalent to driving a car at 30 m.p.h. and maintaining this speed with an accuracy of ±1/230 m.p.h. Velocity errors normal to the plane of the trajectory are not quite so critical, but each 6.6 ft./sec. variation also gives an impact error of a mile.

Basic Design

Graphs on this page show the variation of mass ratio with specific impulse for a ballistic missile of 2,500-n.m. range and also the way in which the all-up weight of the missile per ton of payload varies with its mass ratio.

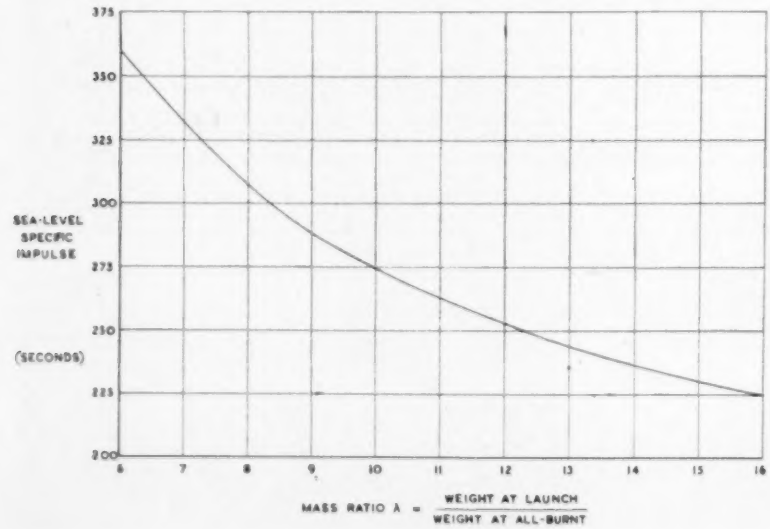
If liquid oxygen and kerosene are assumed as propellents for the missile, giving a specific impulse of 250 sec., the first graph suggests a mass ratio for the Blue Streak of 12.3. For this ratio the second graph gives a missile all-up weight of 45 tons per ton of payload if a structural efficiency parameter of 0.94 is assumed. This compares with 38 tons per ton of payload which was estimated in the Blue Streak assessment published in THE AEROPLANE two weeks ago; this gave the missile's payload as 5,000 lb. for a launching weight of 190,600 lb. In this case the payload was taken to include re-entry nose-cone weight; Mr. Cornford's payload ratio may have allowed only for warhead weight, which could explain the discrepancy.

Re-entry

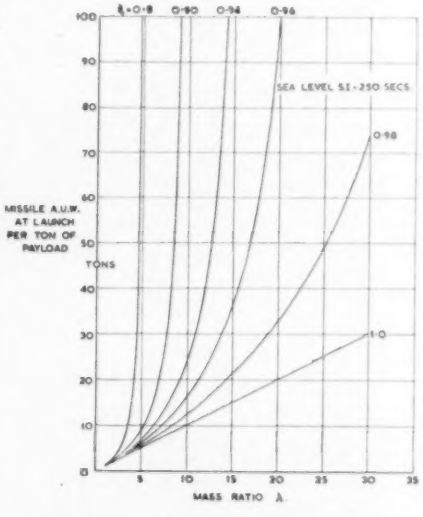
Design of the re-entry nose-cone is a vital factor in the success of any ballistic missile. Mr. Cornford's lecture discussed in detail only heat-sink re-entry nose-cones. These have a high-drag shape so much of the re-entry heating is dissipated in the wake and the remainder is absorbed. Nose-cone materials must have high melting point and high thermal conductivity. Ablative nose cones were mentioned only in passing.

An important parameter in re-entry cone design is $\frac{S.C_D}{M}$ where S is the frontal area in sq. ft., C_D the drag coefficient and M the mass in slugs. If this parameter is low the nose-cone has a short re-entry time; this is beneficial in reducing wind

(*Continued on page 435*)



SPECIFIC-IMPULSE EFFECT.—The higher the specific impulse, the lower can be the mass ratio of a ballistic missile. Graph (left), shows the relationship for a single-stage missile with a range of 2,500 n.m.; it indicates that for a typical S.I. of 250 sec. the mass ratio must be 12.3.



PAYLOAD RATIO.—Shown above is the variation of launching weight per ton of payload with different mass ratios and values of the structural efficiency parameter ξ. The weights are for a single-stage 2,500-n.m. missile.

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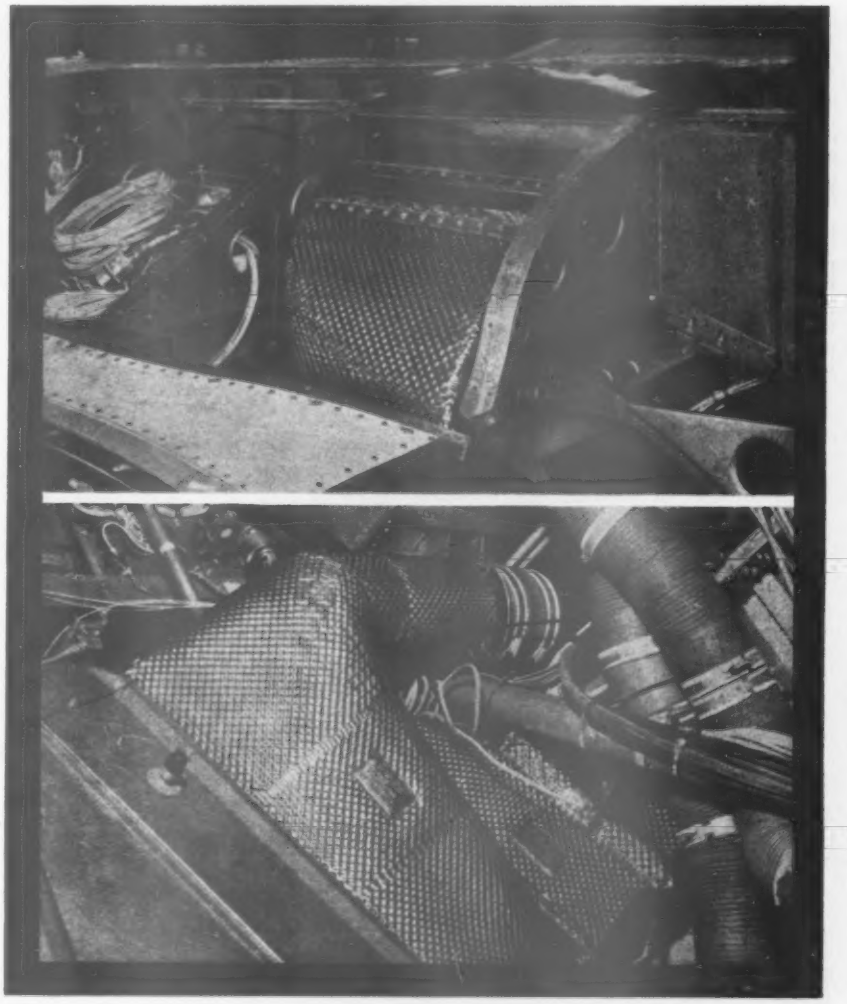

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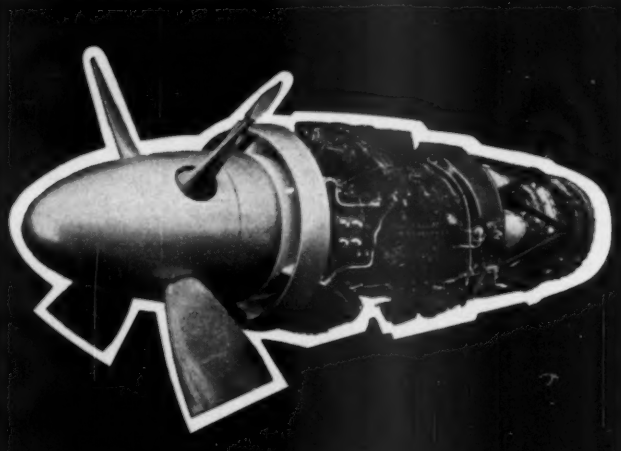

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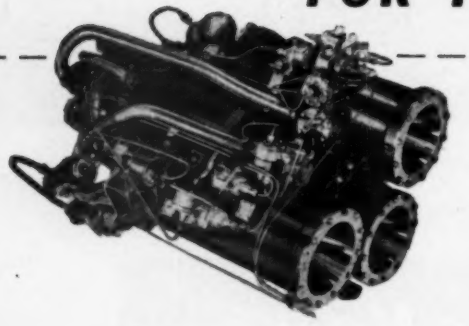
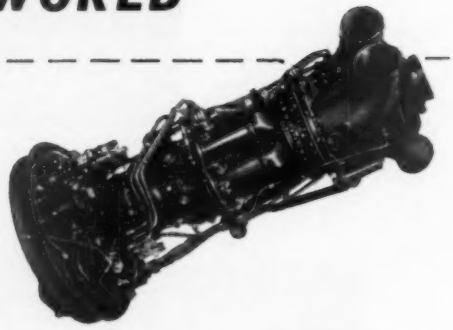
ELAND engines for the Westminster are installed horizontally on top of the fuselage with a mechanical drive to the rotor shaft.

NAPIER AERO ENGINES

FOR THE WORLD





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RE-ENTRY.—The re-entry conditions are shown for the nose-cone of a 2,500-n.m. missile. The parameter $\frac{S.C_D}{M}$ relates frontal area S in sq. ft., drag coefficient C_D and mass M, in slugs.

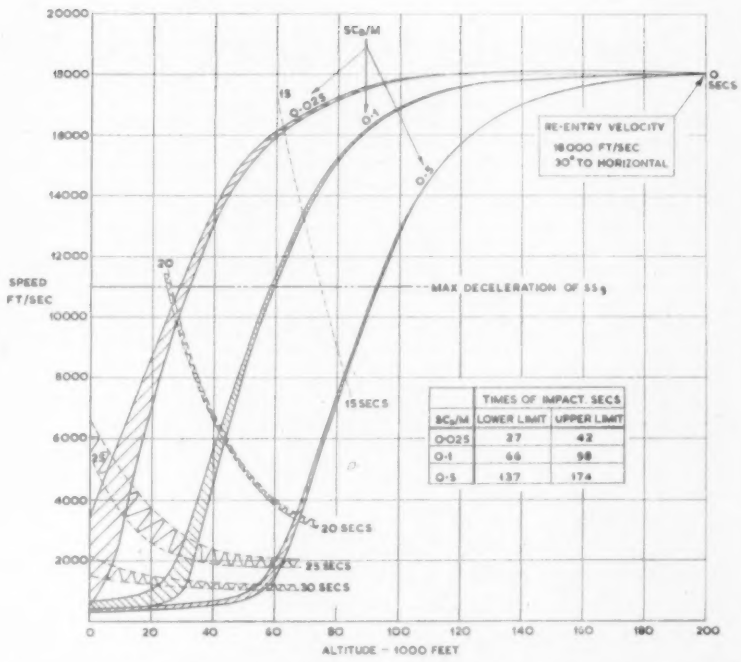
(*Continued from page 434*)

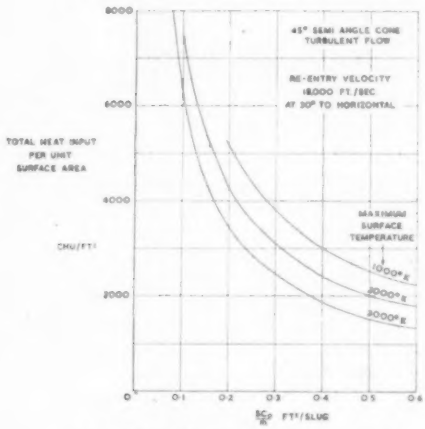
errors and the chances of interception, but the rate of heat input is high. With high values of $\frac{S.C_D}{M}$ the re-entry time is increased but the heat-input rate is lower.

Re-entry conditions for the nose-cone of a 2,500-n.m. missile are shown on this page; re-entry begins at 200,000 ft. with a velocity of 18,000 ft./sec. Speed is plotted against altitude for three values of $\frac{S.C_D}{M}$. In all cases the maximum deceleration of 55*g* is reached when the speed has fallen to 11,000 ft./sec. Depending on the values of $\frac{S.C_D}{M}$, the re-entry times to impact vary between 27 sec. and 174 sec.

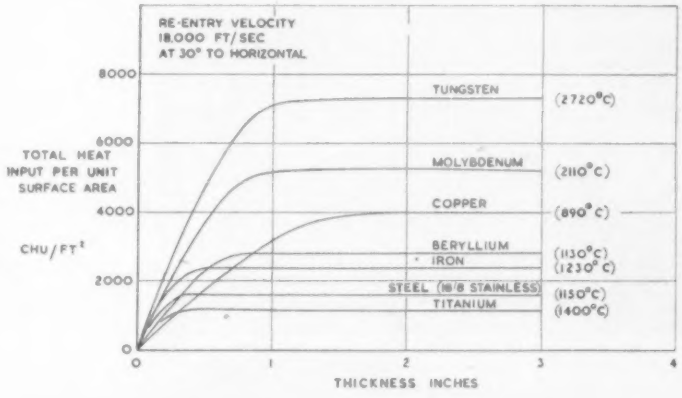
Two other graphs from Mr. Cornford's lecture are reproduced here. One shows how total heat input per unit of surface area varies with different values of $\frac{S.C_D}{M}$; the other shows the total heat input per unit of surface area which nose-cones of various materials will accept during re-entry. The interesting point here is that there is no advantage in having a thickness of metal greater than about 1 in. except in the case of copper, where about a 2-in. thickness can be used with benefit. Increasing the thickness does not allow a higher input to be accepted.

The information given by Mr. Cornford, together with that in the recent R.Ae.S. lecture on Earth satellites by Mr. W. H. Stephens (THE AEROPLANE, February 20), gives an invaluable guide to authoritative British thinking in the fields of missile and space technology. It is refreshing that the veil of secrecy over these subjects is no longer drawn as closely as it has been in the past.—J.R.C.

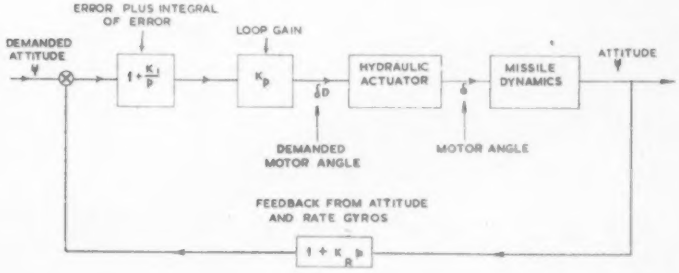




RE-ENTRY HEAT INPUT.—Above, the total heat input during re-entry of a 2,500-n.m. missile's nose-cone is given here for different values of the parameter $\frac{S.C_D}{M}$.



NOSE-CONE MATERIALS.—Above, the heat absorbed during re-entry is shown for a range of nose-cone materials. In each case it is assumed that surface temperature rises to 80% of the material's melting point.



PLANE	NATURE OF ψ_0
ROLL	FIXED DATUM.
PITCH	DEMANDS FROM GUIDANCE SYSTEM, POSSIBLY PRECEDED BY TIME PROGRAMME DURING TURNOVER.
YAW	DEMANDS FROM GUIDANCE SYSTEM, POSSIBLY PRECEDED BY FIXED DATUM

CONTROL.—Left, this is the autopilot control loop for a typical ballistic missile with a gimballed motor.

Aircraft Industry in East Germany

UNTIL comparatively recently, very little was heard about aeronautical activity in the German Democratic Republic. Indeed, before the existence of the Baade BB.152 medium-range jet airliner project became known few people had any idea that the nucleus of an aircraft industry was springing up in East Germany. There is still something of a shortage of information on the subject but visitors to last month's Leipzig Spring Fair were able to learn something of the composition of this industry in general and more about the BB.152 in particular.

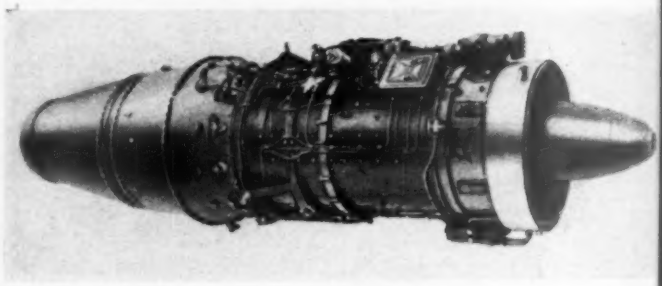
There are six component concerns within the East German Federation of Publicly-owned Aircraft Construction Enterprises; the names of each of these units is prefaced with the letters VEB—standing for Volkseigene Betrieb (publicly owned enterprise). The list is headed by Flugzeugwerke, Dresden, which is concerned with the design and construction of civil transport aircraft. At present, this includes the Baade BB.152—six of which are said to be scheduled for delivery in 1960 and 18 the following year—and the Il.14P piston-engined transport built under licence.

Entwicklungsbau, at Pirna, near Dresden, is responsible for the design and development of turbojet aero-engines; while Industriewerk Karl-Marx-Stadt build piston aero-engines and accessories. Another company in the powerplant field is Industriewerk Ludwigsfelde, said to construct turbojet power units—this suggests that it is a production plant for the 014. The design and manufacture of navigation and other instruments, radio apparatus, hydraulic and electric equipment, is done by Maschinen und Apparatebau Schkeuditz. Sailplanes are designed and built by Apparatebau Lommatzsch. And there are two trading organizations Kooperationszentrale für die Flugzeugindustrie and (for foreign trading) Technocommerz G.m.b.H., Berlin.

A correspondent who visited the Fair and had the opportunity of seeing something of the Pirna aero-engine factory tells us that it came into being in the winter of 1954-55. Although it is by no means completed it already employs about 3,000. Such remarkably rapid development, he comments, has been possible only because the Government of the German Democratic Republic, having decided that the development of an aircraft industry was desirable, made adequate capital available for its speedy and unhampered development.

Even so, this development would have been difficult, in the circumstances obtaining in Germany after the late War, if a core of skilled workers had not been available from the outset. This consisted of former employees of the Junkers and B.M.W. companies who had been captured by the Russians and put to work on aircraft production in the U.S.S.R.

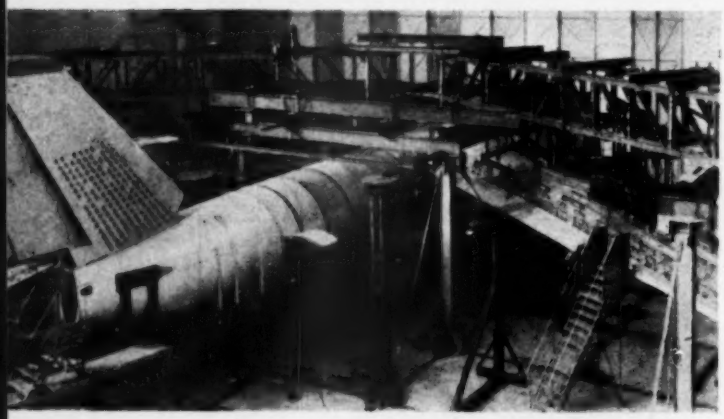
Round this core of key workers has been built up the large group mentioned above, consisting of young men and women (in almost equal proportions) who have been trained, since the end of the War, in the numerous technical schools and colleges established by the Democratic Republic, in anticipation of ever-increasing demands from fast-expanding industries. Senior staff members come largely from the Technische Hochschule at Dresden, which now has about 10,000 full-time students in its various Faculties (which include aerodynamics and mechanical engineering), plus a further 15,000 or so doing correspondence courses for what is equivalent to a Diploma in Engineering.



The Pirna 014 axial turbojet has been developed from a Russian design and delivers 6,950 lb.s.t. for take-off.

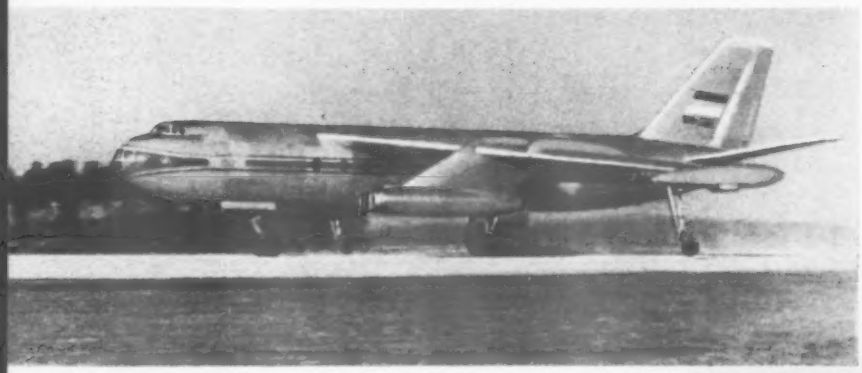
Our correspondent goes on to say that he was afforded every facility for his visit to the Pirna establishment and that there appeared to be no restrictions on what he could see. He was not, however, permitted to take photographs.

Work at Pirna at the present time is concentrated on the development of the Pirna 014 turbojet powerplant for the BB.152. This engine is based on a Soviet design and is said to have been "improved on" by the German design team. It has a 12-stage axial compressor with steel blades in the



Structural test in progress on the Baade BB.152 airframe at VEB Flugzeugwerke, Dresden.

Two sailplanes are built in East Germany, the Libelle single-seater (foreground) and the Lehrmeister two-seater (background); versions of both are available with 15-m. wings as well as those with the original 16.5 m. for the single-seater and 17 m. for the two-seater.



The Baade BB.152 taking off on its first flight last December. Note the bicycle undercarriage arrangement used in this prototype; in production versions the main undercarriage legs will retract into engine-pod bulges.

Seating in the capacious cabin of the BB.152 jetliner is in the common 2/3 arrangement.

earlier and later stages and aluminium-alloy blades in the intermediate stages; a 12-jet cannular combustion system; and a two-stage turbine.

The 014 at present delivers a thrust of 3,150 kg. (6,950 lb.) for take-off, but Prof. Baade has been quoted as saying that it is capable of development to give a thrust of 7,700 lb. Development of the engine is expected to be complete by 1962.

At Pirna, three test beds are already in use and two more are under construction. These last have, it appears, been developed to take more powerful and larger engines than are at present under development.

The piston engine built in East Germany is the 1,900 b.h.p. ASch 82T radial used in the IL-14P. This is manufactured by Industriewerk Karl-Marx-Stadt.

East Germany's Jet Airliner

Intended as a medium-range high-speed civil transport, the four-engined BB.152 follows the transatlantic trend of having its engines carried in pairs in underwing pods. Accommodation is for up to 72 passengers in a tourist-class layout, or 57 second-class passengers, or 48 first-class. Particular attention has been paid to take-off performance and the aircraft is said to be capable of operation with a full payload at tropical aerodromes and at heights up to 8,200-9,850 ft.

A crew of six is carried, comprising pilot and co-pilot, radio operator, engineer and two stewardesses. In addition to the main cabin, which has a volume of 4,060 cu. ft., there is a pressurized cargo compartment in the rear fuselage with a volume of 476 cu. ft., for express freight and mail.

According to reports two prototypes have been built. One was, however, lost in a crash at Dresden on March 5. An eye-witness is reported to have said that the aircraft was about to land, and was a few hundred feet up, when the engines were opened up to avoid an undershoot; there was an explosion and the aircraft dived vertically into the ground.

It should be mentioned here that the full-scale mock-up of the production-type 152 shown at Leipzig had no "observation" windows in the nose of the fuselage. The later undercarriage arrangement is also said to differ from that in the prototype and presumably will be of the type shown in earlier models of the aircraft with the main legs retracting into bulges in the after ends of the engine pods.

Although some equipment for the 152 is being produced in East Germany there are reports that the industry there is anxious to import aeronautical products from the West in the form of accessories, components, instruments and basic materials. That this potential market has prospects for our own industry was indicated by the large contingent of British companies exhibiting their wares at Leipzig. They included, E.M.I. Electronics, Elliott Brothers (London), Ltd., Ferranti, Marconi, Accles and Pollock, James Booth, High Duty Alloys, Smith's Stamping Works, Smith-Clayton Forge, Samuel Osborn, Richard Thomas and Baldwins, Napier, Rotol, Simms Motor Units, Sir George Godfrey and Partners, and Guest, Keen and Nettlefolds.

Technical details of the BB.152 are as follows:—

DIMENSIONS.—Span, 27.0 m. (88.6 ft.); length, 31.4 m. (103 ft.); height, 9.0 m. (29.5 ft.); fuselage diameter, 3.3 m. (10.82 ft.); "aerodynamic" wing area, 138 m². (1,483 sq. ft.).

WEIGHTS (standard version).—Basic, 27,740 kg. (61,000 lb.); empty, 28,920 kg. (63,600 lb.); payload, 6,290 kg. (13,850 lb.); fuel, 9,920 kg. (21,850 lb.); normal take-off, 44,500 kg. (98,000 lb.); overload take-off, 48,000 kg. (105,800 lb.); max. landing, 40,500 kg. (89,000 lb.).

PERFORMANCE.—Max. speed, 920 km.p.h. (572 m.p.h.); cruising speed, 800 km.p.h. (497 m.p.h.) at 10,4-11.6 km. (34,000-38,000 ft.); landing speed, 200 km.p.h. (124 m.p.h.); range at 44,500 kg. (standard type), 2,000 km. (1,240 miles); range, at 46,500 kg. (first-class), 2,500 km. (1,550 miles); range at 48,000 kg. (first-class), 3,100 km. (1,925 miles); range at 46,500 kg. (tourist class), 2,000 km. (1,240 miles); take-off run at 46,500 kg., 985 m. (1,080 yd.); take-off to 10.7 m. (35 ft.), 1,315 m. (1,440 yd.); landing distance from 15 m. (50 ft.); 1,400 m. (1,530 yd.).

Displayed at the Leipzig Fair was this full-scale mock-up of the BB.152 fuselage and one of the Pirna 014 turbojet engines with its principal components.

Flying the Piaggio 149

by John Fricker

THE fully aerobatic touring aeroplane is a conception almost entirely peculiar to the Continent of Europe, but is one which has a great deal to commend it. Agreed that not every private owner has the urge to invert himself and his passengers in a series of wild gyrations, the British national character being what it is, but his flying would be all the better for an occasional such excursion.

Apart from making this possible, the aerobatic tourer has an additional quality in its greatly increased strength factors, while it also lends itself well to the training rôle. In the case of the Piaggio P.149, which is one of the most outstanding examples of the aerobatic touring lightplane, it has scored its biggest success as a military trainer, having been selected by the Federal German Luftwaffe for *ab initio* instruction. Seventy-five P.149s were supplied by the Piaggio company to the Germans, who are also building a further 190 of these aircraft under licence.

The emphasis on its military application, however, should not be allowed to conceal the civil potential of this attractive aeroplane, which can carry up to five people and their baggage. Several P.149s have already been supplied to private owners or operators in Europe, and the example which I flew with Commandante Aldo Gasperi at Piaggio's airfield of Villanova d'Albenga was due for imminent delivery to a Swiss customer.

German-registered, the P.149D (D for Deutschland), D-EDYP, was also furnished in general to Luftwaffe standards, with German lettering and identification labels in the cockpit. It retained the normal airframe configuration of the military-type P.149, although currently produced civil variants have a modified tail assembly.

There have been several changes in fin and rudder design in the P.149 since it was developed from the P.148 tailwheel trainer of the Italian Air Force. In the latest production aircraft for civil use the tailplane has been raised by about six inches, and a fin and rudder of modified contours, with a forward-raked hinge line introduced. This change is designed to "soften" the spinning characteristics of the P.149 for civil use, although the behaviour of the military version in the spin is entirely conventional and unrestricted.

One of the most impressive features of the P.149, on initial acquaintance, is the excellent standard of finish on its all-metal skin, which accentuates the purity of its lines. The Piaggio-built Lycoming GO-480-B flat-six engine, which produces 270 b.h.p. for take-off, is closely cowled and dynamically cooled with the assistance of two exhaust extractor tubes. It drives, through planetary reduction gearing, a three-bladed constant-speed airscrew of Piaggio design and manufacture.

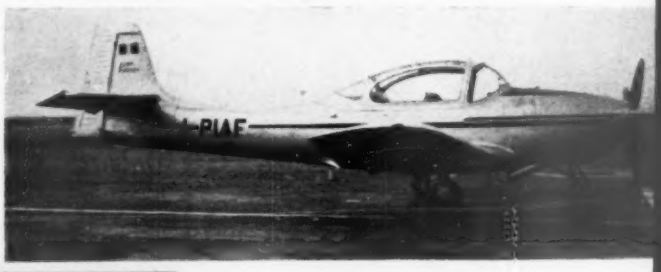
The big metal-framed bubble-type canopy can be slid back sufficiently far for easy access to both front and rear seats in the capacious cockpit, although initial ascent on to the wing roots (especially for lady passengers) would be aided by a retractable step. An indication of the room available for the two front occupants is given by the fact that three people may be accommodated on the rear bench seat on occasions, lap straps being provided for each. The front seats have full aerobatic safety harnesses, although these are of the slightly irritating old-fashioned type often found in Continental aeroplanes, with a confusion of steel rings and a large spring clip.

Provision is made in the front for the wearing of either seat- or back-type parachutes, and if, as in our case, the latter are worn, it is necessary to ensure that the right number of cushions are placed in the seat pan, as there is no other provision for height adjustment. The front seats are adjustable for leg length, however, to reach the dual rudder bars, with their big toe-pedals for the hydraulic brakes, but there are no hand-holds in the cockpit to aid this operation. Dual control extends to duplicated quadrants for throttle and pitch levers, that in the centre also housing the elevator trim wheel and its indicator strip. A rudder trimmer is also provided, but for some reason the control wheel and its adjacent indicator dial is placed almost out of reach at the bottom of the starboard panel.

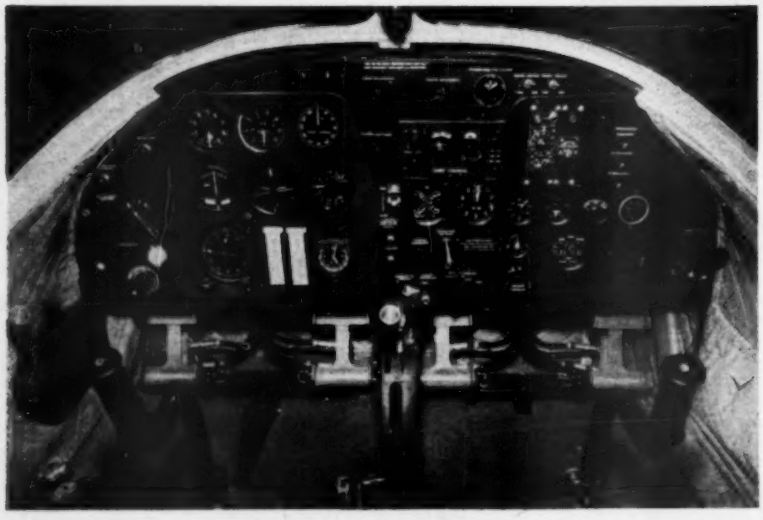
The deep instrument panel houses a comprehensive array of British, American and Italian equipment. The single set of flight instruments in front of the left-hand seat are of British manufacture, and in the P.149D include a G.IVF gyro magnetic compass. In D-EDYP there was also a sensitive altimeter with a warning flag to begin indicating at 10,000 ft. and below. It was completely new to me, however, in having its zero datum at the bottom instead of the top of the instrument face, which I found as confusing as a watch would be with the figures 6 and 12 transposed. Kelvin Hughes, however, produced the instrument in this form to German requirements.

Below the Lear radio compass control box, in the centre of the panel, and the Lear VHF selector on the right, are the engine instruments, including a boost gauge graduated in atmospheres, and a two-needle tachometer. In a single dial are combined the two gauges for the wing-root fuel tanks, each indicating up to 120 litres, or a total capacity amounting to 52.8 Imp. gal. The front occupants of the P.149D are provided with oxygen, with control units on the panel, which also has scattered about its face circuit breakers for fuel booster pumps and other systems.

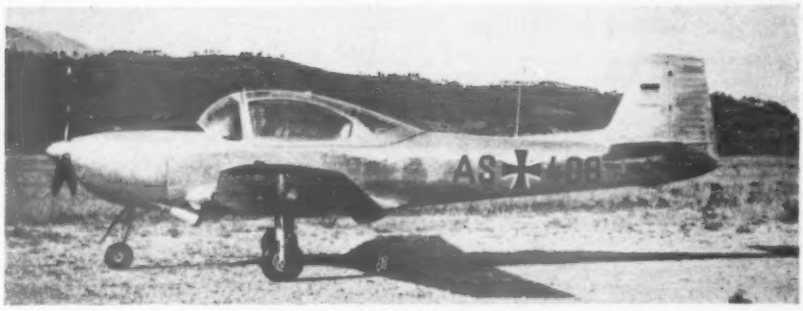
Except for the slightly high cockpit coaming the view from the P.149 cockpit is remarkably good, and the canopy framing interferes very little with 360° visibility. Engine starting is quite straightforward, and the Lycoming idles with a robust roar characteristic of extractor exhaust tubes. In many ways



P.149s produced for civil customers by Piaggio have the modified fin and rudder and raised tailplane shown here, to simplify the spinning characteristics.



A neat and simple cockpit layout with full dual control characterizes the P.149D, which has British flight instruments and American ADF and radio equipment. Its cosmopolitan atmosphere is completed by numerous items of Italian manufacture in the cockpit.



Seventy-five P.149Ds, of the type flown for this article, were supplied to the German Luftwaffe by Piaggio as basic trainers, and a further 190 are being built by Focke-Wulf and Blume. Points of interest in this photograph include the exhaust extractor tubes, clear-view panels in the side windows and the ADF loop fairing below the fuselage.

the Lycoming reminded me of the bigger Merlin in its operation; it is silkily smooth at its high flight r.p.m., and pops and bangs in the same manner when throttled back.

After the parking lever on the starboard panel has been released the P.149 can be taxied as rapidly as desired and steered with precision by means of the nosewheel interconnection with the rudder pedals. At the beginning of a demonstration flight which was conducted throughout *con brio*, the Commandante taxied the P.149 round the perimeter of Villanova at full throttle, showing remarkable cornering stability.

For the shortest take-off, 18° of slotted flap can be selected by means of a manual lever with a push-button release between the front seats. I always seem to have difficulty with this type of flap control, usually when trying to release the button, but that in the P.149 was certainly no worse than others I have encountered. Trims can be left more or less neutral, although I found on opening the throttle for my first take-off (which was into wind) that a fair amount of right rudder needed to be fed in as the Lycoming wound up to its full power of about 1.0 Atm and 3,400 r.p.m.

Foot loads for the steerable nosewheel felt fairly high, and I would have liked a little help from the rudder trim, had it been within easy reach. A fairly substantial amount of aft stick movement was needed at about 60 knots for an unstick almost immediately afterwards, and in this respect the P.149 is similar to many tricycle-undercarriaged jets. On my first attempt I pulled the aircraft off a little late, to the accompaniment of brief vibration from the rapidly spinning small diameter mainwheels. I then eased forward slightly on the stick to allow the speed to build up to the initial climb of about 90 knots, indicating 1,500 ft./min. or so on the sensitive V.S.I.

With a flip of the small switch in the centre of the panel, the undercarriage comes up quite rapidly; there is little change of trim, and the doll's-eye-type indicators soon confirm that the three legs, which are actuated by a single electric motor, are up and locked. Power can then be reduced to about 3,000 r.p.m. and 0.9 Atm and the flap raised for an en-route climb. Apart from a ferry trip along the Côte d'Azur, from Nice to Albenga, my introduction to the P.149 with Commandante Gasperi began with a vertical stall turn soon after take-off, followed by a series of aerobatics of masterly ferocity.

No quicker way of achieving familiarity with a new type has been devised than by launching straight into a red-blooded aerobatic session, and although my efforts were considerably less polished than those of the Commandante the P.149 was both forgiving and flattering. The controls displayed a pleasantly progressive and harmonized increase of stick force with airspeed, which quickly reached aerobatic magnitude because of the power margin and airframe cleanliness. Loops were easy, with an entry speed of about 160 knots and moderate stick forces, while I estimated the rate of roll at a similar speed as about 90-100°/sec.

The ailerons are pleasantly light and responsive, and only a little rudder is needed to keep straight during a roll. In the P.149, the Lycoming is arranged to continue running without interruption under negative *g* conditions for several minutes, which is another very pleasant feature, and an aid for advanced aerobatics. We climbed inverted for a while, and the only shortcoming of the P.149 in this condition appeared to be an absence of straps to keep one's feet on the rudder pedals.

In a half-roll off the top, we pulled "grey-out" *g* from about a 180-knot dive, but still had plenty of margin from the Vne at aerobatic weight, of 218 knots. The P.149 has an ultimate load factor of 9*g*. With a full load of passengers and up to 150 lb. of baggage in the rear compartment, the P.149 is, of course, non-aerobatic, with a never-exceed speed of 199 knots.

There appeared to be no tendency to flick out of any aerobatic manœuvres, and the good low-speed control and stability of the P.149 were confirmed in a series of stalls. After undercarriage extension below the limit speed of 110 knots, and with full flap, the P.149 stalled following a brief warning buffet, at about 45-50 knots I.A.S. The slotted ailerons appeared to be effective down to the stall, which was straight and gentle, and did not seem to vary much, clean and with power off.

No wing drop was apparent, nor any move towards an inadvertent spin, and in fact the P.149 later showed a reluctance, amounting to a positive refusal, to perform the latter manœuvre. We climbed to 10,000 ft. for the attempt, still indicating 700 ft./min. just before levelling out and throttling back. The Commandante interrupted the stall-warning buffet with full left rudder and aft elevators, but although the P.149 went sedately through the motions of spin entry the airspeed began a tell-tale rise as we spiralled earthwards. A second attempt at about 65 knots produced the same effect, but this time the canopy came open a few inches with a bang during the ensuing dive, and we abandoned further efforts.

These characteristics reminded me of the early narrow-ruddered Chipmunks, in which it was sometimes difficult to recognize a true spin, and which required a certain amount of guile for entry, if not recovery. They are entirely acceptable for a military trainer, but, in later variants of both types of aircraft, have been simplified. In its most widely produced form the P.149 is cleared without restriction for spins at the aerobatic gross weight, and apparently loses only about 2,000 ft. in five turns and recovery to level flight.

At 0.8 Atm and 2,700 r.p.m., I found that the P.149 cruised along at 135 knots I.A.S. or so, which at the optimum altitude of 7-8,000 ft. becomes about 165 m.p.h. This was confirmed by the Commandante in a recent non-stop flight over very bad weather from Amsterdam to Villanova, in which 714.5 miles were flown with a slight tail-wind, at around 11,000 ft. About 35-40 min. fuel remained from the initial 52 Imp. gal., after landing, indicating a cruising consumption of some 10 g.p.h. or 16.5 a.m.p.g. These, of course, are remarkably good figures.

Stability when trimmed for cruising followed the usual pattern, and checks for changes of trim with power and aircraft configuration showed remarkably small variations. The elevator trim wheel was wound fully forward and then fully aft, and, although it was effective in operation, the stick loads could be comfortably held with one hand. The same applied to the nose-up tendency resulting from a simulated overshoot in the approach configuration with full aft trim.

In the circuit the P.149 retained its good handling qualities as the speed fell off to about 110 knots, for extension of the undercarriage, followed at 90 knots by half-flap. The fourth notch of the flap lever gives 26°, which with power and a little aft trim results in a comfortable approach at about 85 knots. The flaps are very effective in steepening the glide, and although I found the effort to achieve their full extension to 43° too great on finals the 35° notch was adequate for the difficult approach to Villanova.

Elevator response in the flare-out is good and little aft movement is needed for a smooth touch-down on the main wheels, the nosewheel dropping almost immediately to give directional steering control. The landing run can be kept down to about 200 yd. by maximum foot pressure on the brakes, which did not provide a particularly violent deceleration.

Well-equipped, with a useful load capacity and a performance to match its excellent handling, the P.149 has a civil potential which as yet is largely untapped. Its aerobatic capabilities give it a versatility which is further enhanced by its easy adaptation for photographic survey, tactical liaison and light freighting duties. As a relatively large light aeroplane, it is not expensive at an Italian price equivalent to about £11,000, and we are likely to see more of it in this country.

Leading Particulars

DIMENSIONS.—Span, 36 ft. 5¾ in.; length, 28 ft. 10½ in.; height, 9 ft. 6 in.; gross wing area, 202.5 sq. ft.

WEIGHTS.—Empty, 2,557 lb.; max. useful load, 1,147 lb.; aerobatic weight, 3,197 lb.; max. gross, 3,704 lb.

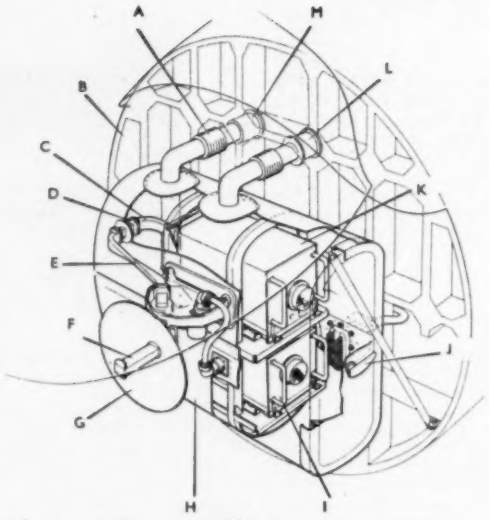
PERFORMANCE (at max. weight).—Max. speed at sea-level, 190 m.p.h.; cruising speed, 67% METO power, at 7,500 ft., 166 m.p.h.; at 56% METO power, at 10,800 ft., 146 m.p.h.; initial climb 980 ft./min.; service ceiling, 19,800 ft.; stalling speed with flap, 60 m.p.h.; range, with full tanks and allowances, 680 miles; take-off run to 50 ft., 1,312 ft.; landing run, from 50 ft., 1,017 ft.

Compact Weather Radar

DURING recent years weather radar has tended to become almost essential equipment for World-wide airline work and the value of the equipment is now accepted for almost all transport operations.

So that weather and terrain-mapping radar could be available for use with small aircraft, and fitted to others retrospectively, the Radio Corporation of America developed a lightweight, small-volume system which can be installed, without major modifications, to aircraft such as the Twin-Bonanza and Aero Commander as well as to medium-size transports such as the CV-230, DC-3 and Lodestar. This weather radar, the AVQ-50, is available, for simplified retro-fitting, in a self-contained pressurized pack assembly which the small dimensions of the equipment make possible.

The R.C.A. weather radar pack is seen here installed in the nose of a Viscount. The drawing on the right shows the details of the self-contained assembly.



KEY

A—Flexible metal bellows; B—Pressure bulkhead; C—Flexible waveguide; D—Waveguide bulkhead connector; E—Waveguide; F—Antenna; G—12-in. or 15-in. dish; H—Pressurized container; I—Accessory unit; J—Quick-release access door; K—Transmitter/receiver; L—Plannair blower; M—Filter.

This kit assembly is to be marketed by R.C.A. Great Britain and by their sub-distributors, Marshalls' Flying School, of Cambridge, where it was demonstrated last week. The kit consists of a pressurized container holding the major radar components and small enough to go within a small-size radome and containing all wiring and connections necessary for an installation independent of the airframe assembly.

Cost of the Maldives Plan

ONE revelation in the report on the Air Services Appropriation Account for 1957-58, by Sir Edmund Compton, the Comptroller and Auditor-General, is that the cost of building the Gan staging post has now risen to £3,800,000.

The original estimate, in June, 1957, for an aerodrome on Gan Island and a wireless station on Hittadu Island, was £2,700,000; it was revised in January of last year to £3,150,000.

The main reason for the latest increase is given as the higher cost of providing an aggregate for the runway at Gan because the Air Ministry was not allowed to develop causeways between Gan and the other islands, from which the aggregate could have been won at lower cost. Another reason was the decision, in view of the long-term use to which the R.A.F. expects to put the post, to extend the runway paving to 1,200 ft.

Costs have been increased by the delay in getting on with the job pending conclusion of the negotiations with the Maldivian Government. Originally the R.A.F. wanted a 100-year lease, but the Maldives have been pressing for a shorter term. The estimates do not include the cost of providing alternative accommodation for displaced islanders, nor for compensation.

Forty Years of Service

MR. ROBERT HICKS WALMSLEY, who recently retired from the Ministry of Transport and Civil Aviation was frustrated in his first attempts to enter aviation. However, once he did get his foot in the door his whole career has been in aviation. And indeed it is understood that it may well continue to be so.

Born in January, 1899, he was educated at University College School and then in 1917 attempted to join the Royal Flying Corps. Failing to do this he was commissioned to the Royal Engineers and after service in France and as a prisoner of war from May 28, 1918, he returned to London University. He took a B.Sc.(Eng.) with Aeronautics in June, 1922.

In February, 1923, he joined the Airworthiness Department, R.A.E., under Goodman Crouch and until the middle of 1928 handled engineering and airworthiness problems for Service and civil aircraft. In July, 1928, he transferred to the Air Ministry, Kingsway, and worked under J. S. Buchanan (now Sir John) in the Directorate of Technical Development until November, 1934, when he returned to the Airworthiness Department, R.A.E.

In August, 1936, he took over the duties of engineer officer to the Experimental Flying Department of the R.A.E. In January, 1937, he was put in charge of the Technical Publications Department, where the records show that he was able to pull it round and improve the output, which had fallen badly. In March, 1937, he was promoted to senior technical officer. His assignment to T.P.D. lasted until August, 1938, when he became resident technical officer at Handley Page, Ltd.

On the outbreak of hostilities in September, 1939, he was sent as supervising R.T.O. to Handley Page, Ltd., to see the Halifax out into the R.A.F. In May, 1940, when the Ministry of Aircraft Production came into being he was transferred with so many others to the new department, and successively served as R.T.O. and assistant director, dealing with adaptations and modification of the American aircraft used by the R A F

In February, 1946, he was transferred to the Ministry of Civil Aviation as assistant secretary with technical responsibilities and there he remained until his recent retirement.

A Pioneer Public Relations Man

WE have only recently learned of the death of a long-time worker in aviation and of one who at one period was widely known in this country and on the Continent, the late H. Victor Paine, who died earlier this year at Surbiton.

Charles Brown writes:—

Victor worked with his brother Hubert Scott Paine in the Supermarine Aviation Co. from its inception. When Supermarine was taken over by Vickers he joined the latter company as publicity manager of Vickers Supermarine and the aviation department of Vickers, Ltd.

It is in this capacity that many of us will remember him. Enthusiastic, with keen assessment of news value and entirely without bluster. From a small room in Westminster he constituted the whole of the Publicity Department without even a personal secretary; if something needed typing he had to call upon the typing pool.

In this way he publicized the advent of a new aeroplane, such as the Spitfire and Wellington, or the breaking of a World's record—and with amazing success. One recalls events like the Schneider Trophy Races and the now almost forgotten achievement by the two Wellesleys which flew non-stop from Ismailia to Darwin, creating a record which stood for many years until it was beaten—but by a four-engined aircraft. Such was the work of public relations in H.V.P.'s day, before men of his calibre were replaced by vast publicity machines.

Victor Paine had many friends; I am proud to have been one of them.

Private Flying

THE FLIGHT OF "WINGS FOR PEACE"

ON Friday evening, March 20, routine night flying was in progress at Yeovilton. Two Venoms were airborne. The weather: visibility 2,000 yd., ⅛ cloud at 2,000 ft. In the wardroom there was a mess dinner and the new Commander, Cdr. M. J. L. Blake, was in the chair.

At 20.35 hrs. the Wren operator, P. O'Dunn, monitoring the distress frequency in Air Traffic Control reported to the controller that there was an aircraft in trouble and that Gloucester control was helping it. The pilot of this aeroplane was clearly

Bill Mullen with the Mooney Mk. 20, named "Wings for Peace," which he flew from Houston, Texas, to Yeovilton.

American and he announced that he had partial engine failure and requested immediate assistance. Yeovilton took over control of the aircraft from Gloucester and identified it on the search component of the GCA radar, homed him and brought him in to a GCA landing at 20.42 hrs.

The aircraft turned out to be a Mooney Mk. 20 single-engined low-wing monoplane. The pilot was William R. Mullen of 625 Bluebell Road, Kerrville, Texas. Take-off had been from Houston, Texas, and the object of the flight was to break the World's solo distance record which had been set up by Odom in 1949. It seemed to the pilot that he had failed by about 50 miles and that he had actually flown just short of 5,000 miles. He had taken off at 12.35Z time and had been airborne 32 hr. 7 min.

He was taken up to the wardroom where he made a triumphal entry just after the Loyal Toast and the mess president announced to a most appreciative audience that it had a distinguished visitor from Houston, Texas. Mullen made a most charming speech which included a remark to the effect that he was trying to get to Paris but the engine seemed to want to go to Yeovilton, so he thought he would ride with it.

As the evening developed his story unfolded. His position is that of regional sales manager with Mooney Aircraft, Inc., Kerrville, Texas, and the object of the flight had been to publicize the capabilities of this new aeroplane.

His description of the aircraft was as follows:—

Mooney Mk. 20, four-place, single-engine low-wing monoplane, with a Lycoming O-540 engine of 250 rated h.p., and a cruising speed of 210 m.p.h. at about 75% power. His engine was non-standard. The standard engine is a Lycoming O-360 with 180 rated h.p. Aircraft A.U.W., 2,540 lb. Normal fuel capacity of the aeroplane, 49 U.S. gal., but this aircraft was carrying 300 U.S. gal. His Great Circle route took him over New York, Newfoundland, and the North Atlantic, with an expected landfall in the Bay of Biscay. He had 21 hr. of oxygen and an estimated 35-hr. range.

The weather deteriorated at Boston and from Newfoundland onwards he was pretty well IFR all the way across the Atlantic. His cruising altitude depended on a compromise between icing level and economy range height, and 5,000 ft. turned out to be the best height. Very lonely from Newfoundland on until he picked up Shannon on his low-frequency range and ADF set. Eventually established contact with Shannon on 126.7. He was obviously well to north of track and decided that he could not reach his destination (Rome) but felt he could reach Paris.

On selecting the last fuel tank the engine was clearly not receiving adequate fuel supply and he experienced a partial engine failure. He was then flying at 5,000 ft. and called London on 126.7 explaining his trouble. He was told to go to 125.5 where he was received by London, Gloucester and Lyneham. He was told that his nearest master airfield was Lyneham but he replied that he could not make the distance of 40 miles. Yeovilton then took him under control and he landed safely.

This aircraft had a pretty interesting history in that it had been dropped into the Atlantic some time ago approximately 40 miles off the coast of Spain after a similar flight. It was towed ashore by Spanish fishermen and returned to England by H.M.S. "Corunna."

Mr. Mullen stated that his firm in Houston, Texas, found Naval hospitality on these occasions most agreeable. D.B.L.

H.J.C.'s CLUB COMMENTARY

● FIRST a Tiger Club, now a Tiger Pub. The enormous number of pilots who have been associated with the D.H. Tiger Moth will be interested to know that the brewers Courage and Barclay are opening a new public house near Rochester aerodrome which is to be called "The Tiger Moth." Sir Geoffrey de Havilland has given permission for the name to be used, and it is expected that he will be present at the opening ceremony at midday on April 14.

The brewers are inviting many people who have helped to make the Tiger Moth a famous aeroplane, and an invitation is extended to others who have been associated with it to attend as guests. This sounds like real generosity!

"The Tiger Moth" is on the Maidstone-Chatham road (A229) at the junction with Shirley Avenue. A representative of its aeronautical namesake will be on the aerodrome, and the Tiger Club hopes to be there.

We would like to see this practice of naming pubs after famous aircraft extended. We know of "The Comet" at Hatfield; "The Falcon" at Woodley; and "The Canopus," also at Rochester. And another aviation pub is "The Startled Saint" at Biggin Hill, wherein are the signatures of local Battle of Britain pilots.

Perhaps some readers can tell us of other inns whose names have an aviation significance.

● THE TIGER CLUB gave its first show of the year at Sywell, the home of the **Northamptonshire Aero Club**, on Easter Monday, March 30. It lasted for 2½ hr., and began with a formation "T" composed of five Tigers, a Hornet, a Jackaroo and a Jodel.

Other items in the programme included a tied-together display, the Tigers landing with links unbroken; an exhibition race between four Tigers; the "Bishop," G-APDZ flown inverted by its namesake.

Three members of the **British Parachute Club**—Mike Reilly, Ken O'Rourke and Sue Burges—made a formation drop; two Turbulents performed, and a Jodel was put through its paces. There was a sailplane demonstration, and balloon bursting, and three members of the Sywell branch of the Tiger Club did some beautifully synchronized formation aerobatics.

● PLANS for a new flying club at Derby, to be known as the **Derby Air Centre**, have now been completed and

operations are to begin shortly. This club will replace the former Derby Aero Club, which stopped flying two years ago, and will be administered from Elstree by Mr. David Ogilvy, the manager of the **Elstree Flying Club.** Both clubs are, of course, under the control of Derby Aviation, Ltd.

To begin with, the Derby centre will use an Alpha, G-AIBW, and a Hawk-Trainer 3, G-AKPG, although the latter will eventually be replaced by a Chipmunk in keeping with the company's modernization policy.

● AT ELSTREE the club flew 655 hr. 40 min. from the beginn ng of the year up to March 19. There are now six full-time instructors on the staff, the newest addition being Mr. Gordon Bedggood, and four regular part-time instructors help out at week-ends.

The next course for the C.P.L. begins on April 21. Three students who finished the last course—D. Cowell, D. Osgood and P. Kalber—have now started working for the parent company at Derby Airport.

Brochures describing the deferred-payment training scheme, whereby pupils can have up to £200-worth of instruction for an initial deposit of £7 (mentioned in our issue of February 13) have now been circulated and the club expects some good response.

An air display is being planned for some time in June.

● BREAKFAST PATROL—Surrey and Kent Flying Club, Biggin Hill, 09.00-09.30 hrs., next Sunday.

Gliding Notes

by Dr. A. E. Slater

WITH 17 entries and 35 pilots from eight different clubs, the Midland Gliding Club's Easter Rally at the Long Mynd was the biggest yet, but of how many? Nobody's memory at the club could be jogged to that extent, though the first rally was certainly no later than 1934, which everyone believed to be the year Tony Goodhart flew to the east coast.

There were two laminar and four ordinary Olympias, six Skylark 2s and a Skylark 3, three T-42 Eagles, and the Yorkshire Club's Slingsby Swallow; besides this and the home club, machines came from the Surrey and Army Clubs at Lasham, Kent, Coventry, Derbyshire and Lancashire, and the R.A.F. club at Leeming, while Elliotts of Newbury entered the laminar Olympias. Of these, David Ince flew the Olympia 419, and John Williamson the 401 fuselage with 415 wings attached. Another ex-Leszno machine was the Skylark 2 flown by Philip Wills in the Standard Class and now owned by Cdr. M. P. Seth-Smith, R.N., because he couldn't persuade the Navy to buy it.

* * *

Good Friday, March 27, brought a rather difficult cold sector across ground still wet from a depression, and the task of distance to the N.E. along a line through Camphill, which would have reached the sea near Scarborough, involved cross-wind flying. David Ince did at least reach the right county, having to land near Wakefield because the best clouds were massed in the preceding Airway and he had to stay too far below them to be able to glide on to the next lot. The thermals were so torn by the strong wind that he could rarely perform more than half a circle in lift, but some good cloud streets around Leek provided straight-ahead flying. He covered just over 100 miles, and Mick Kaye took his Eagle nearly as far.

Capt. E. G. Shephard took the Army Skylark to Newark, and John Williamson came fourth by going to Denstone, north of Uttoxeter, having avoided a cloud mass in an Airway by deviating and subsequently got 7,000 ft. in a cumulus in "free" air. Five others earned points, but one pilot put his Skylark out of action by landing with violent side-drift a few miles from the Mynd.

GIVING WAY.—Since the Kent Gliding Club was refused permission to use Detling, flying has been taking place at Lympne. Here a Slingsby T-21 and a Skylark 2 are seen waiting for a Dakota to land there on Easter Saturday.

SATURDAY, March 28, was a better day, but still not good enough for the east coast, though nearly everybody seemed to be giving Great Yarmouth as a goal in the hope of exceeding 300 km. The task was free distance, and W. "Bill" Lawson, who had brought his Eagle all the way from Scotland by road, far outdid all the others with 143 miles to Marham, S.E. of King's Lynn, with A. J. Thorburn as co-pilot, taking from 11.10 to 14.40 hrs. Cloud streets were plentiful, but with a W.S.W. wind they had to keep crossing southwards from one to another. After a sticky patch east of Leicester, the Fens finally brought them down.

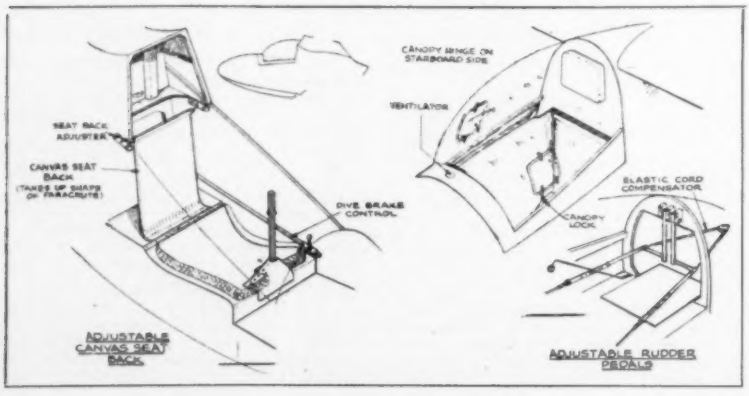
Flt. Lt. E. Clarke made 128 miles and W.O. Ted Stark, with 103 miles to Wittering, raised the Army into first place in total score, with David Ince second, the R.A.F. third, Lawson fourth and John Williamson, who came down at 12.45 after too early a start, fifth. Seven people went away under the same street as it crossed the Mynd. Once again Ince kept so far below a cloud mass in an Airway that the ensuing cloudless sky let him down. S. B. "Bill" Wills made hopefully for a "cooling tower" N.E. of Lichfield, but remembered too late that it would be out of action during Easter.

On this day we heard over the radio that Philip Wills had taken off from Perranporth evidently in pursuit of a 500-km. "Diamond," but unfortunately had to come down at Exeter after 80 miles. From Lasham the only cross-country was of 44 miles by Ann Welch in the Goodhart Skylark 3, and from Camphill nobody went away. The aggregate distance by 15 Mynd pilots was 1,015 miles.

A 31-mile race on Easter Sunday had to be called off because of the reluctance of an occlusion to pass over as quickly as expected. But it had cleared by Monday, leaving a N.N.W. wind which helped people along on a race to the Bristol Club at Nympsfield, provided they left before a lunch-time hailstorm soaked the ground. This was won by David Ince at 38 m.p.h. average over the 61 miles, while John Williamson took 13 min. longer, partly because he spent time gaining unnecessary height for crossing the Severn. Capt. Shephard was the only other competitor to get there, but as 60 of the 100 points were given for distance, his slowness did not prevent his keeping the Army up to second place in the total score.

Three others went part of the way, Graham Elson doing best in the Derbyshire and Lancashire Club's Skylark until he hit high-tension cables on the approach to land near Hereford; he flew through a gap in a belt of trees which hid the tell-tale pylons.

Tuesday's sky was overcast at cirrus level and nearly so with strato-cumulus, so the total scores remained as before, and David Ince won the Mynd Cup with an average score of 82 per day out of a possible 100. The Army Club averaged 75 and John Williamson 65, and the R.A.F. came fourth with 36, followed by the Scottish and Camphill Eagles. Lawson's 100 points on the Saturday averaging out at 33.3 per day.



A NEW VERSION.—After five years' experience with the Skylark 2, Slingsby Sailplanes, Ltd., has produced the Skylark 2B, several new features of which are seen alongside. They include a new cockpit arrangement; the wing spars have been redesigned to conform to the new B.G.A. requirements; the control systems have been modified and there is a new canopy to improve vision. An adjustable seat and rudder pedals are also innovations.

Correspondence

Louis Blériot at Dover

MAY I refer to Sqn. Ldr. Gudgeon Bayliss's inquiry about a photograph of Blériot landing at Dover (THE AEROPLANE, March 27)?

In the course of research which I have been conducting into this epic flight I discovered that no photographs of him were taken after he took off from France until some minutes after he had crash-landed at Dover, though several faked photographs of his arrival at Dover were circulated at the time.

Several photographs of M. Blériot and his machine, surrounded by an excited crowd at Dover, are in existence, and these could probably be obtained from the library of any national newspaper; I can recommend those taken at the time by the *Daily Mail* and the *Daily Mirror*.

London, S.W.1. JAMES GILBERT.

No. 76 Squadron R.A.F.

I AM compiling a pictorial history of No. 76 Squadron and would like to hear from any ex-members who may be able to provide me with photographs of interest to this project.

Photographs of the Squadron at any stage of its history would be welcomed, and I am particularly short of data for the periods 1937-40 and 1945-46. I would be very pleased if anybody who may be able to help would write to me at the undermentioned address.

No. 76 Squadron,
R.A.F., B.F.P.O. 151. J. F. G. STONHAM, Sqn. Ldr.,
Officer Commanding, No. 76 Squadron.

Aid from the State

WOULD you please, through the medium of your magazine, agitate for the implementation of a State scheme for the training of pilots for B.O.A.C. and B.E.A.? Unless such a scheme is set up, I, and probably many other boys also, will find it impossible to become airline pilots owing to the large amount of money needed for training.

Hollingworth, Manchester. THOMAS UPRICHARD.

Training and the Flying Clubs

I HAVE read with considerable interest the leading article entitled "Training Pilots for the Future" in THE AEROPLANE of March 13. One of the most important statements made in this article is: "A fundamental requirement for Commercial Pilots is adequate flying hours on the airways."

But there are some other requirements, the first of which I referred to in a letter to THE AEROPLANE following your leading article on the same subject of March 4, 1955. In this letter I said: ". . . It seems to me to be fundamental that before young men can be expected to select a career as pilots in Civil Aviation they must first be assured that there is a reasonable prospect of permanent and progressive employment. . . ." Unfortunately, this prospect does not seem yet to have been created.

The second requirement is sound basic training, and in my letter of March, 1955, I described what this Association was doing to introduce such training into the air centres operated in conjunction with our flying clubs.

The third requirement is adequate hours under training on the airways, and the fourth is a really thorough advanced course to be given to the pilot after an initial airways experience.

The fundamental requirements thus seem to add up to the following:—

(i) To create conditions for "a reasonable prospect of permanent and progressive employment" for a commercial pilot.

(ii) To give the pilot a sound course of basic flying and ground training for the Commercial Licence and the Instrument Rating.

(iii) To give him a conversion course to enable him effectively to carry out duties as first officer on the type or types in which he is initially to fly.

(iv) To give him adequate flying hours on the airways as supernumerary crew member or first officer.

(v) To give him an advanced course (a very advanced course) of both flying and ground training.

Having regard to efficiency with economy, this surely is the sequence, and surely the most effectively economical way of carrying out requirement (ii) is in the air centres of the A.B.A.C.

The course for the Commercial Pilot's Licence and Instrument Rating that this Association has drawn up is now being applied at a number of these air centres, and we have done much else besides with a view to assisting with the training of commercial pilots which I will not take up space to describe.

But I would like to make one final comment. Your article refers to the "Air University Scheme." I have no knowledge of how it is proposed that this scheme shall work, but I trust that it is planned that the "University" shall give University, and not prep school training which would be a waste of both time and money.

London, S.W.1. G. H. M. MILES.
Chairman,
Association of British Aero Clubs and Centres.

Groundabout

Civicmanship. Our Manchester office sends this story. That city's suggestion that it is the country's second most important stirred up journalists in other places. One in Scotland telephoned the Lord Mayor of Manchester and asked "But you would agree, wouldn't you, that Prestwick is the second airport in Britain?" The Lord Mayor countered "Well hardly —I always thought that was London."

*

Have you heard of the U.S. manufacturer who got an $80 million contract to make an electrical satellite —one million to build the satellite, 79 million for the extension wire?

*

Change of Residence

PROcrastination. I wonder if the P.R.O.s and other friends who are still sending releases, etc., to my old address would send them instead to the new address set out on the card they received two weeks ago?

*

The Name Game. Now that Ansett-A.N.A. Airlines are about to embark on a new life with their first Electra, I really think that Reg Ansett should mark the occasion by altering the company's present mouthful of a name to, say, AIR ANASETT.

*

Collect, Select, Protect. Over a drink recently, a publicity man told me, just for my personal amusement (I think), some stories about his company's activities. To his surprise (I believe) I printed one here and got a note: "I shall never talk to you again unless, of course, you promise to print it!"

*

Comme elle est parlé. In the preliminary invitation to the Paris Air Show there's a nice question which goes "*Assurez-vous une chronique aéronautique?*" meaning, they say, "Are you an aviation writer?" But I stuck to my first ignorant interpretation "Are you a chronic aeronaut?" and put a determined "Yes." Not that I quite like that word *une*.

*

Stridentical. The next letter I opened was about Boeing's new Development Centre where, among other excruciating testing devices, they have a horn which blows eight times louder than the air-raid siren on top of the Chrysler Building in New York and can rip metal "like a jet-propelled can-opener." Perhaps it was the previous item which, with this bit of news, evoked the accompanying sketch.

by Lorenz

NOTES AND EVENTS

CIVIL AIRCRAFT MARKINGS.—The 1959 edition of the Ian Allan "ABC of Civil Aircraft Markings" is now on sale, price 2s. 6d. It lists alphabetically the registrations of all current British civil aircraft and the fleets of foreign airlines regularly serving British airports. The lists are supplemented by an excellent selection of photographs ranging from the Arrow Active and Currie Wot to the Comet, Caravelle and 707.

AIDING ACCESS.—A new telescopic ladder for use in servicing, maintenance or fabrication work has been produced by Aero Controls, Ltd., of Northampton. It automatically closes and opens to provide easy access to a working platform, and as the rungs remain equidistant the possibility of toe-trapping or slipping is eliminated. These ladders can be supplied in steel or light alloy as required.

MARCONI ORDER. — The U.S. Government has placed an order with Marconi's Wireless Telegraph Co., Ltd., for the supply of a mobile microwave telephone and telegraph communication system to link many of the U.S.A.F. bases in the United Kingdom. The complete system, worth about $3½ million, has been planned by Marconi's in association with the Automatic Telephone and Electric Co., Ltd.

FOR COMPUTERS.—A booklet has been prepared by the Management Consultants Association for those who are thinking of using computing devices. Called "Preparing for a Computer," it gives information on what a computer will or will not do and indicates what needs to be done if it is decided to have one. The booklet can be obtained free from the Association at 4 London Wall Buildings, London, E.C.1.

INDUSTRIAL BAROMETER.—Mechanism, Ltd., of Croydon, Surrey, has developed a new precision aneroid barometer for a range of meteorological and industrial applications. Stated to have an accuracy comparable with a mercury barometer, the unit has a standard range of 900 to 1,050 millibars and a basic accuracy at normal room temperature of ±0.3 millibars.

M.o.S. APPROVAL.—The Pygmy P.T. series of electrical connectors manufactured by the Aircraft Components and Connector Division of Thorn Electrical Industries, Ltd., have been approved by the Ministry of Supply. Under pressurization test the connectors had a leakage of less than 1 cc./hr.

S.T.C. HANDBOOKS.—A new technical service introduced by Standard Telephones and Cables, Ltd., last month has extended the company's standard Valve Handbooks to include up-to-date information on all S.T.C. components. Entitled "Components Handbook," the first issue comprises three volumes which will be extended as necessary and maintained with quarterly amendments.

AERO GOLF.—The annual match between the Aero Golfing Society and the R.A.F. Golfing Society was held at Wentworth on March 20. A team of 22 from each Society played foursomes in the morning and afternoon, the result being a win by the R.A.F. of 14 matches to seven.

Aviation Calendar

April 12.—Breakfast Patrol organized by Surrey and Kent Flying Club, **Biggin Hill,** 09.00-09.30 hrs.

April 13.—R.Ae.S. Halton Branch lecture, "Some Experiences of an Airline Pilot," by Capt. O. P. Jones (B.O.A.C.), at the Branch H.Q., R.A.F. **Halton,** at 18.45 hrs.

April 14.—Institute of Metals, 1959 May Lecture, "The Scientific Uses of Space Exploration," by Prof. F. Hoyle, at the Royal Institution, Albemarle Street, **London,** W.1, at 19.00 hrs.

April 15.—R.Ae.S. Branch, A.G.M. in the lecture room, flying club, **Brough,** at 17.10 hrs.

April 15.—Aircraft Recognition Society, A.G.M. in the R.Ae.S. library, 4 Hamilton Place, **London,** W.1, at 19.00 hrs.

April 17.—Institute of Navigation lecture, "The Decca Trials," by Col. C. Powell (Decca Navigator Co.), at 1 Kensington Gore, **London,** S.W.7, at 17.15 hrs.

April 21.—R.Ae.S. all-day discussion, "The Structural Effects of Kinetic Energy," at the Inst. of Mech. Engineers, Birdcage Walk, **London,** S.W.1, at 09.45 hrs.

April 21-23.—Ninth annual convention of the International Airline Navigation Council, Hotel Manhattan, **New York City.**

April 22.—R.Ae.S. Hatfield Branch discussion evening, at The de Havilland restaurant, **Hatfield,** at 18.15 hrs.

April 22.—Women's Engineering Society London Branch lecture, "Development of the Gas-turbine Aero-engine," by A. B. McKenzie, at Hope House, 45 Great Peter St., **London,** S.W.1, at 19.00 hrs.

April 23.—R.Ae.S. Preston Branch A.G.M. and film show, at the R.A.F.A. Hall, **Preston,** at 19.30 hrs.

April 23.—R.Ae.S. Southend Branch A.G.M. and film show, at the Labour Hall, Boston Avenue, **Southend-on-Sea,** at 19.30 hrs.

April 24.—Fourth Tangier rally, **Morocco.**

April 24-26.—Sales Week-end organized by W. S. Shackleton, Ltd., **Kidlington Aerodrome,** Oxford.

April 27.—R.Ae.S. Guided Flight Section lecture, "Basic Principles of Radar with Particular Reference to Aircraft and Missile Applications," by F. D. Boardman, at the Institute of Civil Engineers, Great George St., **London,** S.W.1, at 18.00 hrs.

WEST AFRICAN AGENCY.—A new company, Air Stock West Africa, Ltd. (to be known as ASWA) has been formed to represent, in Nigeria and the Cameroons, Ghana, Sierra Leone and Gambia, manufacturers of aircraft and aviation products. Its managing director, Mr. C. C. McCarthy-Jones, O.B.E., A.F.C., is now resident at the company's offices in Lagos, Nigeria. Among the companies which the agency represents are the Piper Aircraft Corpn. and Vickers-Armstrongs (Aircraft), Ltd.

P.R.O. MOVE.—The Public Relations Office of the Elliott-Automation Group is now at 34 Portland Place, London, W.1. (Telephone, Langham 9271.)

Company Notices

NEW COMPANY

Sywell Airport Restaurant, Ltd. (623,623).—Private co. Reg. Mar. 19. Cap. £5,000 in £1 shs. Subscribers (each with one sh.): Charles M. Newton, Church Cottage, Overstone, Northampton, company director; James T. D. Shaw, The Brewery House, Old, Northampton, farmer. First directors not named. Sec.: B. E. Minards. Reg. Off.: 8 Drapery Buildings, Northampton.

New Patents

APPLICATIONS ACCEPTED

813,034.—Bendix Aviation Corporation.—"Apparatus for modifying the contour of air-swept surfaces of an aircraft or missile in accordance with prevailing operating conditions."—Dec. 12, 1955 (Dec. 15, 1954).

813,036.—Bendix Aviation Corporation.—"Apparatus for modifying the contour and opening of an aerofoil surface and an air intake aperture to an engine of a flying machine."—Dec. 12, 1955 (Dec. 15, 1954). (Divided out of 813,034.)

Applications open to public inspection on May 6, 1959; opposition period expires on Aug. 6, 1959.

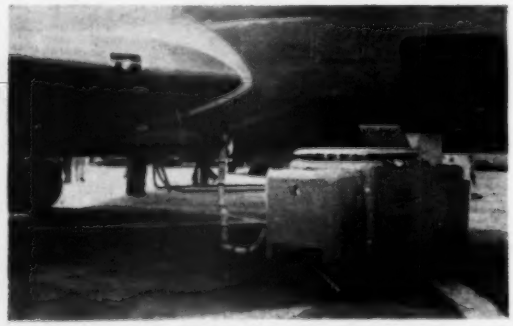
813,176.—Folland Aircraft, Ltd., and Davies, I. J.—"Survival packs."—Sept. 26, 1956 (Sept. 26, 1955).

813,184.—Zaic, F.—"Control of model aircraft."—June 1, 1956 (July 21, 1955).

813,297.—Franklin Institute, State of Pennsylvania.—"System for alleviating the effects of gusts on aircraft."—April 25, 1957 (May 7, 1956).

813,469.—United Aircraft Corporation.—"Jet exhaust nozzles."—Feb. 6, 1957 (Feb. 15, 1956).

Applications open to public inspection on May 13, 1959; opposition period expires on Aug. 13, 1959.



BOEING STARTER.—Auto Diesels, Ltd., has received contracts from M.o.S. and B.O.A.C. for the Aydee turbine air starter, model L.P.I. The Ministry contract covers equipment to be used for starting the latest marks of V-bombers and the B.O.A.C. units will be used for the Corporation's Boeing 707 fleet.

Birth Notices

Barber.—On March 20, at Gors Maternity Home, Holyhead, to Evelyn (*née* Wood), wife of Flt. Lt. K. Barber—a son.

Carter.—On March 25, at 27 Hesketh Crescent, Swindon, to Margaret (*née* Codd), wife of Flt. Lt. B. R. Carter—a daughter.

De Salis.—On March 27, at the Louise Margaret Hospital, Aldershot, to Jane (*née* Sears), wife of Flt. Lt. P. De Salis—a daughter.

Howden.—On March 22, at Bromley Maternity Hospital, to Sheila (*née* Barclay), wife of Flg. Off. R. Howden—a son.

Hutchinson Smith.—On March 20, at the Clifton Nursing Home, Whitchurch, Salop, to Jill (*née* Alsop), wife of Sqn. Ldr. D. W. Hutchinson Smith—a daughter.

Jay.—On March 26, at the Perivale Nursing Home, Ealing, to Gwenda (*née* Williams), wife of Flt. Lt. R. H. Jay—a son.

Latham.—On March 21, at Ipswich and East Suffolk Hospital, to Barbara (*née* Caswell), wife of Sqn. Ldr. P. A. Latham—a daughter.

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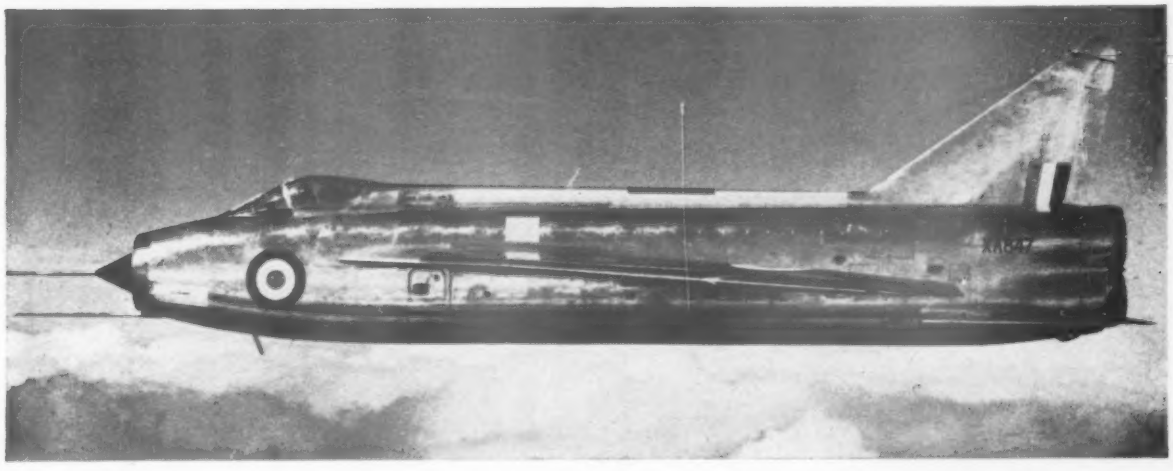

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AIR TRANSPORT ADVISORY COUNCIL.

THE AIR TRANSPORT ADVISORY COUNCIL give notice that they have received the undermentioned applications to operate scheduled air services:—

FROM DERBY AVIATION, LTD., OF DERBY AIRPORT BURNASTON, DERBY:—

APPLICATION NO. 2467 for a Normal Scheduled Service initially with Dakota aircraft and later also with Herald aircraft for the carriage of passengers and supplementary freight on the route Birmingham and/or Cardiff and/or Bristol-Bournemouth (Hurn) (tech)-Bilbao at an initial frequency of one return flight weekly increasing later to three return flights weekly for seven years from 1959.

APPLICATION NO. 143/11 for an amendment to the terms of approval of the U.K. Internal Service which they are authorized to operate with Dakota and Marathon aircraft on the route Nottingham (Tollerton) and/or Derby (Burnaston) and/or Northampton (Sywell)-Wolverhampton (opt)-Birmingham (Elmdon) (opt. tech or traffic)-Southampton (Eastleigh) (opt. tech)-Guernsey and/or Jersey at a frequency of up to 18 return flights weekly until September 30, 1959, so as to permit the company to combine to operate the service for 10 years until September 30, 1969, and to continue to exercise traffic rights at Birmingham between November 1 and March 31 each year or alternatively during a period starting seven days after British European Airways terminate their summer operations from Birmingham and ending seven days prior to the commencement by the Corporation of the following summer's operations.

FROM B.K.S. AIR TRANSPORT, LTD., OF BERK HOUSE, BAKER STREET, LONDON, W.1.

APPLICATION NO. 2471 for a U.K. Internal Service with Heron aircraft chartered from North-South Airlines for the carriage of passengers, supplementary freight and mail on the route Leeds (Yeadon)-Bristol (Whitchurch)-Exeter at a frequency in accordance with traffic demand from June 1, 1959 to May 31, 1960.

APPLICATION NO. 216/4 for permission during the period June 1, 1959 to May 31, 1960 only to operate Heron Aircraft chartered from North-South Airlines in addition to the types already authorized, on the U.K. Internal Service which they are at present authorized to operate with Dakota and Anson aircraft on the route Newcastle (Woolsington) and/or West Hartlepool (Greatham) and/or Leeds (Yeadon) and/or Bournemouth (Hurn) and/or Bembridge (Isle of Wight) at a frequency of seven return flights weekly until March 31, 1961.

These applications will be considered by the Council under the Terms of Reference issued to them by the Minister of Civil Aviation on July 30, 1952. Any representations or objections with regard to these applications must be made in writing stating the reasons and must reach the Council within 14 days of the date of this advertisement, addressed to the Secretary, Air Transport Advisory Council, 3 Dean's Yard, London, S.W.1, from whom further details of the applications may be obtained. When an objection is made to an application by another air transport company on the grounds that they are applying to operate the route or part of route in question, their application, if not already submitted to the Council, should reach them within the period allowed for the making of representations or objections. 484-3

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developments in flight equipment...

CONTROL UNDER 'g' The new approved Hymatic Anti-G valves AG5 and AG6, developed with R.A.E., improve upon the existing standard AG2 by using air tapped from the engine compressor. Weight, bulk and servicing time are thereby saved by eliminating storage bottles, ground charging valve and separate reducing valve and filter. High or low gradient protection up to 8 g can be selected to suit personal comfort. The AG5 weighs 1.9 lb. for supply pressures up to 150 p.s.i. The AG6 weighs 2.2 lb. for supply pressures up to 300 p.s.i.

Hymatic, as leading engineers in the Aircraft equipment field, have been responsible for the design and precision manufacturing of many products, including:

Hot air reducing valves
Snap jacks and air bottles
Oil reducing valves
High pressure relief valves
Restrictor valves
Pressure maintaining valves
High flow reducing valves
Non-return valves

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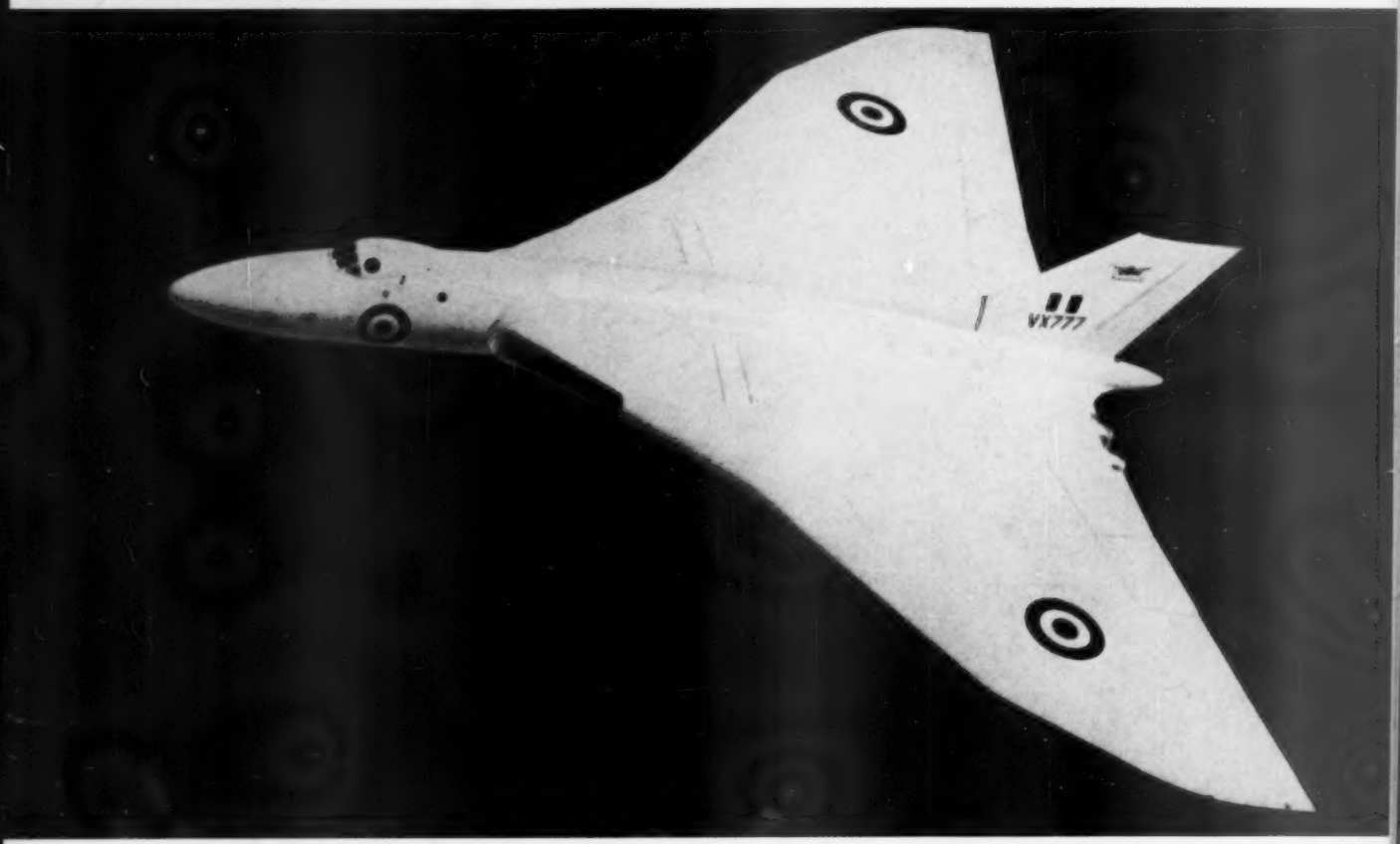

17,000-lb THRUST without reheat

High-thrust version of the Bristol Siddeley Olympus in production for Avro Vulcan Mark 2

During its two years in service with the Vulcan, the Olympus has earned high praise from pilots and ground crews.

According to an official report, "the Olympus sets a standard of handling at altitude which has never been equalled by any other turbine engine." Pilots have frequently carried out "slam" accelerations and decelerations at the highest altitudes at which the aircraft has flown—the exact height cannot be revealed, but is well over 50,000 ft.

In reliability, too, the Olympus has achieved an unsurpassed standard. Only routine attention is required between installation and removal for overhaul—snags have been held to an all-time low. Unscheduled removal of engines has been remarkably low, too, and overhaul life already compares favourably with other military powerplants.

Vulcans have made extensive overseas flights to many countries, including East Africa and Rhodesia, South America, Canada and the United States of America. Such was the confidence in the Olympus that on the great majority of these flights no provision was considered necessary for any engine spares whatsoever away from the aircraft's home base.

Continuing development, increasing thrust

First Vulcans went into service with the Olympus 101, rated at 11,000 lb. Later, in improved versions, thrust increased from 12,000 lb of the Mark 102 to an official type-test rating of 17,000 lb without reheat for the Olympus 201 in production for the Vulcan Mark 2. This engine, with Bristol Solar fully variable reheat, is running on the test bench at 24,000-lb thrust.

Further Bristol Siddeley Olympus versions are already under development which enhance still further the engine's qualities of light weight, high power, and low fuel consumption.

Bristol Siddeley

ENGINES LIMITED